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electron user

Vol.3 No.5 February 1986 £1

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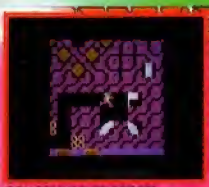

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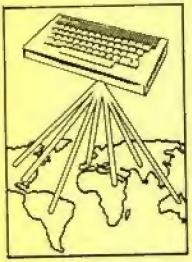

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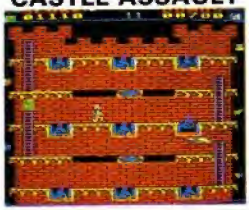

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electron user NEWS

SALES HIT THE ROOF!

ELECTRON User **has doubled its circulation in the last year.**

The first nine months saw steady sales growth but the last quarter recorded a dramatic increase.

"We have been staggered by what has been happening", says Steve Fletcher of Europress Sales and Distribution, suppliers of *Electron User* to the news trade.

"Naturally we had expected there would be a growing number of readers, in part due to the volume sales of the machine.

"But this has taken me by surprise – and I've been in this game for quite a few years. It really is a success story in its own right".

Derek Meakin, head of Database – publishers of *Electron User* – also expressed his delight with the booming circulation.

"It all comes down to the fact that the Electron is an excellent machine", he says, "and we feel we've got a first class magazine.

"So that adds up to a powerful combination".

NEW SOFTWARE IS FLOODING IN

A SURVEY of leading software houses active in the Electron field has revealed that more than 100 programs are currently in the pipeline for the machine.

Conducted by *Electron User*, it conclusively rebuts reports that software for the Electron will effectively dry up by the end of 1986.

Companies are working on some 50 new games titles, 30 educational programs and in excess of 20 utilities.

One firm alone, Tynesoft, plans to release a dozen titles for the Electron this year.

"As far as we are concerned, the Electron is a very good machine and will be around for a long time to come", says Tynesoft's Trevor Scott.

"With all the new machines coming onto the market creating a giant user base, it simply cannot be ignored".

Time and again during the course of the survey software houses agreed that the sheer size of the current Electron user base will dictate continuing support.

"With all those Electrons having been sold over Christmas, the market will go from strength to strength", forecast Mary Spence, a director of educational software house Kosmos.

Her views were echoed by spokesmen for all the leading software companies.

"I feel that the Electron has got a lot of life left in it", said Adrian Kearney of Slogger Software.

"The machine has much to offer both software people and peripheral manufacturers".

On the peripheral front, a major supporter of the Electron is Advanced Computer Products.

"We have several new enhancements for the machine due out any day which will ensure it will be around for a long, long time to come", says John Huddlestone of ACP.

"They've tried to write it off many times in the past – but they've been wrong, just as they are now".

Trevor Scott of Tynesoft had the final word by insisting that Electron users themselves could play a major role in securing the future for their machine.

"Much depends on themselves", he said, "if they maintain their interest, then there will always be support".

Users query Mail story

ELECTRON users throughout the UK are becoming increasingly upset over unsubstantiated reports casting doubts on future support for the machine.

One story which prompted a flood of letters to *Electron User* appeared in the computer section of the Daily Mail.

It claimed that the Electron had "flopped" and insisted that it was unlikely there would be any new software for it.

Here are extracts from two typical letters urging *Electron User* to clarify the position:

★ ★ ★

"MY family has been delighted with the Acorn Electron we bought nearly 18 months ago, and find Electron User *a stimulating extra.*

"But we're a little disappointed at the worsening availability of software, and are disturbed at comments found in the Daily Mail.

"Can you say anything to dispel our fears? I would like to recommend the Electron to friends, but ..." – **H.F. Butcher, Enfield.**

"I HAVE been an Acorn Electron owner for just over a year now and I am becoming increasingly concerned about the computer's future.

Recent drastic price reductions, and rumours in the media, suggest

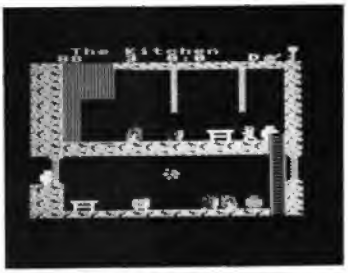
SPECTRUM TOPPLED

THE Electron became the most popular home computer in the UK during the critical run up to Christmas.

Although final sales figures have yet to be officially released, the machine was reported to have knocked the Spectrum out of the number one spot, starting in November.

Once returns have been completed it is expected that leading High Street giant Dixons will have sold well over 100,000 Electrons during the festive season.

Danes help produce new Electron titles



Product of Anglo-Danish cooperation ... Citadel

SUPERIOR Software has linked up with a team of programmers from Denmark to produce a string of Electron releases this spring.

The first, Citadel, is a conversion from the BBC Micro which the Danes worked on for 12 months. And if offers players the chance to win prizes of £100 and £200.

Superior brought in the Scandinavians after becoming interested in their programming methods.

"Their involvement is necessary", says Christopher Payne of Superior. "Not only are they very good programmers, but they use a fantastic impacting technique".

This allowed them to cram in the 100 detailed screens, colours and host of animated characters which featured in the original Citadel on to the Electron's smaller memory.

"The program overspill appears as a fluctuating patterned strip at the bottom of the screen", said Payne. "It is the only way it could be released on the Electron".

Citadel itself is an arcade adventure. The aim is for the player to deactivate an enemy teleport system and so prevent an invasion.

But before he can do so he must meet many challenges and solve many puzzles. First the Citadel must be escaped from, then a Witch's house, Stonehenge, the pyramids, deserts, mountains and oceans.

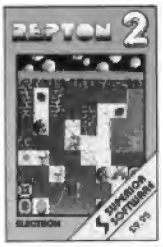
Other dangers include fearsome monks, mummies and wolves.

And to make the game more exciting Superior has hidden three crowns within the adventure. The first person to locate any two will win £100.

There is also a prize of £200 for the first person to obtain the game's maximum 99 points.

An earlier release by the company was Repton. Now an enhanced version, Repton 2 – more colourful, more puzzles and with improved graphics and sound is available for the Electron.

Both Citadel and Repton 2 cost £9.95 on cassette.



Users' fears

From Page 7

that the outlook for the machine is bleak, with the possible halting of production early in 1986.

These suspicions were reinforced when Dixons purchased a large stock of the machines and proceeded to sell them at bargain prices.

Not only the computer, but the software for it concerns me. Few software companies seem willing to invest money in the creation of new titles for the Electron (Micro Power for instance) and slowly the existing software available is declining.

Acorn have said very little about this, and I feel a definite answer should be revealed.

It is only fair we should be told, even if they are to remove the machine, as until then I am reluctant to spend any more money.

Please could you inform me of any information that emerges?"

– **Malcolm Molyneux, Luton.**

What is really popular?

COMPUTER software charts don't always accurately reflect the true popularity of games, says *Electron User* subscriber Neil Sedgwick.

So he wants the help of other readers in compiling a new kind of Top Ten for Electron software.

"Normal charts only show how well the games are selling, and not how popular they really are", says Neil.

"For example, many people may have bought Overdrive and not liked it but nearly everyone who bought Micro Olympics – not as many – may think it is wonderful.

"What is really needed is a system where Electron users can vote for their favourite game.

"Rather than just moan about this I would like *Electron User* readers to vote for their favourite games so I can make up a proper Top Ten.

"I would like users to send me two Top Five lists – one for the games they most liked, in order of preference and one for games they least liked".

Neil's address is 2 Keldholme Road, Rodley, Leeds, West Yorkshire LS13 1JN.

Elite not being dropped

RUMOURS that Acornsoft had abandoned the Electron version of the best selling cult game Elite have been strongly denied.

Several dealers and other members of the computer trade had contacted *Electron User* to say that they were unable to obtain Electron versions of the game in the run-up to Christmas.

But Acornsoft's marketing manager, Jeremy Preston, says the dried up supply pipeline was only a temporary hiccup.

"It is true that Electron versions of Elite were out of stock for a while", he told *Electron User*. "But we reordered in time to get a significant number of copies on to the marketplace before Christmas, although we were not able to supply every dealer.

"However we are again reprinting and there should be no shortage of Elite for the Electron in the forseeable future".

UPGRADE 'BOOSTS ELECTRON'S SPEED 100 PER CENT'

A NEW upgrade for the Electron is said to increase the machine's speed by up to 100 per cent, making it comparable with that of the BBC Micro.

The Elk Turbo-Driver from Slogger also enables the Electron to run non-Mode 7 BBC programs. There is no need for software modification.

"It will give the Electron more life, more scope than ever before, in fact, send it into overdrive", claims Slogger director Adrian Kearney.

"Users will no longer be looked down on by their BBC counterparts as they will be able to access a lot more sophisticated software, such as Elite and Aviator, and run them at their proper speed".

A switch enables the user to alternate between turbo and normal speed. The driver board – which is compatible with all add-ons such as the Plus 1, Plus 3, Rombox and adapter boards – can be fitted by Slogger or any of its authorised dealers. Return is guaranteed within seven days.

Price is £42.

A kit is also available, priced £29.95 but Kearney warns that it should be fitted by someone with considerable soldering skill.

The processor chip inside the Electron has to be unsoldered and the board, with chip now plugged in, soldered in its place.

News of the Turbo-Driver comes shortly after Advanced Computer Product's announcement that it is to launch a module for the Electron which will increase program speeds by up to 300 per cent.

The module – a Tube interface – does this by enabling the user to connect a second processor with 64k of extra ROM.

Electron ... "moving into overdrive"

Add-ons for quiz

A RANGE of software modules called the Factfile 500 Series has been released for the Electron by Kosmos.

They supplement the existing Answer Back Quiz programs also produced by the company.

Each Factfile covers new ground with topics including natural history, general science geography, first aid, arithmetic, spelling, English word usage and British history.

A database of 500 questions and 2,000 multiple choice answers is contained in a module. It is also fully compatible with the Answer Back games. Price is £3.95 on cassette.

Church records go on database

ONE of the growing band of Electron owners using their machines for serious applications is the Rev. Leslie Cowley, vicar of St. Leodegarius, Nottingham.

With the aid of Mini Office software he maintains records of payments to his church's covenant scheme and also uses the database facility for keeping information about his parishioners up-to-date.

St. Leodegarius is a slightly incongruous setting for high tech, being one of the oldest places of continuous worship in the Midlands.

It was built by the Normans in about 1200 on the site of an even more ancient Saxon church and is named after the martyred bishop of Auton in France

"I believe I'm the 64th vicar of St. Leodegarius and I'm certainly the first to own a computer", says Mr Cowley.

"I'm the latest in my family to own an Electron. My grandchildren have them and my son-in-law, a Ministry of Defence computer programmer, writes games software on his as a hobby".

What's your top score?

SO you think you are a whizz kid when it comes to computer games?

Well here's your chance to prove it. *Electron User* has taken up a reader's suggestion to provide a monthly highest score (or shortest time where applicable) table for games listed in recent issues.

All you have to do is to record your optimum performance next to the appropriate game. If you are number one, then we'll let you know in the March issue. Remember, please be honest. But aren't all Electron Users?

Paint Roller (November)	
Defuse (November)	
Missile Attack (December)	
Get Set Santa (December)	
Fruit Worm (January)	
Helicopter Rescue (Jan.) *(Shortest time)*	
Grebit (February)	

Name ..... Age .....

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Simulated Mode 7 display is achieved by using the on board Teletext display controller which includes an enhanced character set and allows a higher quality display with extra control features such as Alpha Black true double height and three languages. (High Mem: Using the new Mode 7 is at 8000.) This feature also allows large text "adventure type" programs written for the BBC to be run on the Electron ie. Colossal Adventure etc. Display is achieved via the RGB output for the adapter with an optional UHF modulator for users without monitors.

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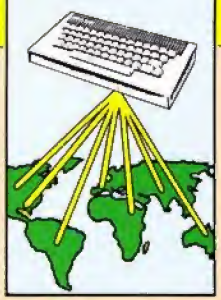


Electron shall speak unto Electron...

... and even unto mainframes, as NIGEL PETERS assesses the Tellstar communications package

THE envelope landed on my desk with a thump. "It's the new Electron communications package from Pace", panted the managing director, tired from carrying the money to the bank, "we need a review, quick".

"Is there a manual?" I asked, stupidly. "Of course there isn't. A manual indeed. You'll be wanting your wages next", came the reply as he headed back to the vaults.

"A manual", screeched the loathsome Waddilove from behind his back copies of the Sun. "Real men don't use manuals".

Odious toad. I know for a fact he goes to bed with the Advanced User Guide each night. That's why he always looks so tired in the morning.

However we Peters like a challenge, and the result is this review of Tellstar, the fascinating combination of RS423 interface and communications software from Pace.

On opening the envelope I found a neat black plastic box, obviously destined for one of the slots in the Plus 1.

Coming from it was a black lead with a DIN plug (like the one on the cassette lead) at the end.

And since Tellstar is a communications package it didn't take me long to figure out that it was an RS423 lead, the bit that goes into a modem.

So I fitted the cartridge into one of the Plus 1 slots, put the lead into the modem, switched on and got ... nothing. Well, that's not actually true. What I did get was the

```
>
```

sign that showed me that the Electron still had the Pascal cartridge fitted.

Now it was a safe bet that inside the Tellstar cartridge there was a ROM containing software. The problem was to get at it. To use Pascal or View you just use a star command as in:

```
*PASCAL
```

or:

```
*VIEW
```

So I was certain that what I needed to invoke Tellstar was a star command, but star what? Well:

```
*what?
```

didn't work and neither did any others. I just sat there gazing blankly at the screen (I spend a lot of time doing that) until inspiration dawned.

Tellstar is a communications package produced by Pace. And Pace produce another communications package, Commstar, for the BBC Micro. You get into Commstar with:

```
*C.
```

so why not try that out on the Electron?

I did and lo and behold it worked, which was wonderful for three reasons. The first is that if it hadn't you wouldn't be reading this enlightening review.

The second is that I was fairly familiar with Commstar – it's the standard communications software many of us use – and the opening menu of Tellstar was a dead ringer for Commstar's first page.

And the third was I had a manual for Commstar and, with a bit of luck, Tellstar wouldn't be too different.

The result was I was able to explore one of the most exciting pieces of Electron software to come my way in a long time. Without, I may add, the aid of a manual or a safety net.

Tellstar provides Electron users with two things. The first is an RS423 interface, the second is the software to use this interface in conjunction with a modem (of which more later) to talk to other computers in a number of different ways.

If RS423 looks familiar it's because the Plus 1 start up message tells you that it's got an RS423 even when it hasn't.

The story goes that the guy who wrote the software for the Plus 1 was told that it would have an RS423 built in while the guy who did the hardware wasn't informed of this.

Whatever the truth of the tale, now, at last, you can attach one to your Electron.

But, having said that, what is it?

Put very simply, an RS423 interface is a device that allows information from a computer to be sent along a wire to another computer.

To go a little deeper into it, it converts data such as Ascii codes from the parallel 8 bit form used inside the micro to a serial form which can be sent bit by bit along a wire to another computer.

It also does the reverse job, taking serial information bit by bit from another computer and rearranging it into the 8 bit form that the Electron can use in its workings. Figure I shows this happening to the letter A.

Actually it's a lot more complicated than that. The data can be sent at different speeds along the wire – the baud rate – and the data itself can take different formats to meet different conditions, hence the terms such as word length, stop bit, start bit and parity that all communications freaks come to know and love.

Also, apart from the very simplest cases where you can just use a wire between two RS423 ports, you'll be using the telephone system to send and receive signals.

And to do this you need a modem, a device that takes the signal produced by the RS423 port and converts it to a form that can be sent long distances over the telephone network.

It also does the reverse, taking the signals from the phone line and turning them into a form the RS423 can use. Figure II shows how the micro, RS423 and modem work together.

When you first enter the

→

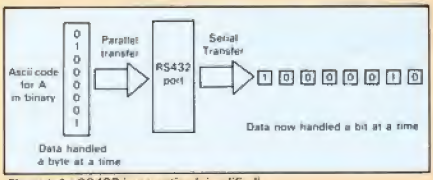


Figure I: An RS423 in operation (simplified)

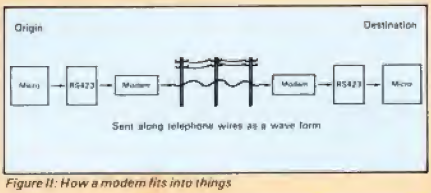
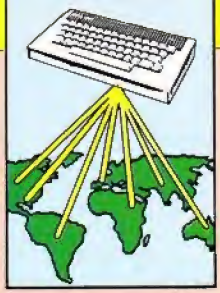


Figure II: How a modem fits into things



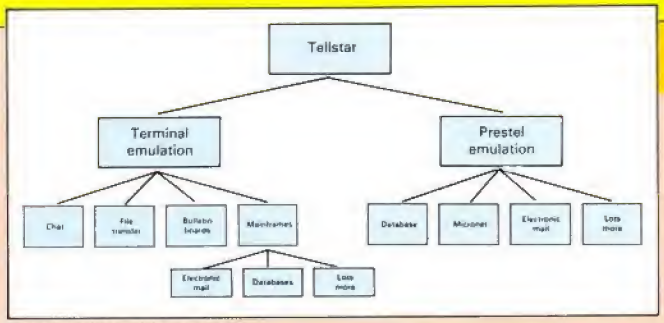


Figure III: Just a few of the uses of Tellstar

From Page 11

world of micro communications you'll come across a lot of jargon such as parity, protocols and baud rate.

I don't have room to go into them all in this article and really, there's no need to, as it's all done for you with Tellstar.

The communications software is there to make life easy for you. When you first enter it, it's set up to default settings, which are the ones you will usually use. As you gain more experience and want to try different baud rates and so on, Tellstar allows you to change the settings using a simple to follow sequence of menu choices.

We'll come to some of the different settings later. First let's take a look at some of Tellstar's uses and just mention the jargon as needed.

Since it's a communications package the obvious use of Tellstar is to communicate. But with what? Well you can communicate with other micros, bulletin boards, mainframes, databases, viewdata systems and all sorts of things.

Figure III shows some of the alternatives.

Tellstar does all this communicating in two main emulations or modes. The first is terminal mode, a general-purpose mode which allows communication with all sorts of computers.

The second is the Prestel mode which turns the Electron into a Prestel terminal, allowing you to enter one of the largest viewdata systems in the world.

When you start off, you're in terminal mode but you can change between the two modes at the touch of a button from the main menu. Figure III gives some ideas of the possibilities of each mode.

Since it's the default, let's explore at the terminal mode first and look at one of its simplest roles, the chat facility.

This allows you to phone another micro user and talk to him using the micro's keyboard. To do this, all you have to do is to press C to tell Tellstar that you want to talk or Chat to someone.

You then phone the person up and when they've picked up the receiver, switch in the modems to handle the signals and chat away. What you type in appears on the other micro's screen and vice versa.

Strangely enough, you won't see what you type in on your screen unless you press the E for Echo option, so it is mirrored or echoed back to your screen.

Of course behind the scene things are a little more complicated. For a start both micros have to be using the same types of data packets, sent along the wire at the same speed.

In computerese, the two micros have to be configured so they can talk to each other. This includes various menu items such as Initialise and XON/OFF and such matters as parity, stop bits and so on.

However the joy of Tellstar is that the default options (for the technical: 300/300 baud, 8 bit word with no parity and one stop bit) are perfectly adequate for chatting. That is, so long as both micros are set up, or configured, this way.

You don't have to concern yourself about the settings unless you want to. And when you do feel you know enough to experiment, Tellstar's system of menus makes changing the options simple.

Just chatting may seem a little daft. After all, you're linked by the phone, why not talk to each other? And, of course, that's right. But chatting has it's value, as we'll see.

A second use of the terminal mode is to send files from one computer to another, a procedure that Tellstar makes simple.

However when you're setting up to transfer files, it's always best to chat a little first to make sure that all the settings are all right and that the telephone connection is a good one.

Then, when you're satisfied, you can transfer the file from your micro to the other at the touch of a button. The file transfer method used by Tellstar will handle practically anything, programs, Mini Office files, data files, whatever. And, of course, you can receive files as well as send them.

It's a simple way of getting information from one micro to another. I've used Tellstar to send programs from my Electron to a BBC Micro 40 miles away. It certainly beats the post! And the other micro doesn't have to be an Electron or BBC Micro.

It can be any micro so long as the data it sends obey the same conventions as you are using. Having said that, unless the Basics are very similar, this tends to restrict you to machine code programs and Ascii files.

As I've mentioned, sending files is simple and you can do it at the default settings.

If you try altering any of the RS423's configurations – to speed things up or talk to another micro with different communications software – you might have to experiment for a while until both micros are correctly set up. This is where chatting comes into its own.

So far our two uses of terminal mode have meant that we have to have a willing and cooperative partner in charge of the other micro.

A third use, however, allows Tellstar to go solo (well, almost). This is when it's used to talk to bulletin boards.

All a bulletin board is is a micro that's dedicated to running a special kind of communications software.

It has a modem that automatically answers calls, so to get on to a bulletin board all you do is ring up the number and, if the line's not engaged, you're on. That is, if you've got your Electron configured correctly.

In nearly all cases the bulletin boards will work at Tellstar's default settings, so getting on to a bulletin board is an easy way of starting your communications career.

The board acts as an electronic version of a noticeboard. Once on the board you can read messages, leave messages and even, in a few cases, download software into your micro for later use.

Bulletin boards have a fascination all of their own and can be addictive. Boards are springing up all over the country and abroad which you can contact with little or no trouble.

But beware, while the use of the boards is free, you're paying for the phone call and some of these boards are a long way away. It's decidedly a cheap rate operation.

The fourth use of terminal mode we'll look at is when it's used to talk to a mainframe computer.

If you want, you can look on this as a super bulletin board, with lots more facilities such as sending messages to people's mail boxes via the mainframe, accessing huge databases and lots, lots more.

The drawback is that unlike bulletin boards they're not free. You usually have to be a subscriber before you learn the

```
*******************************
        FloraLink
*******************************
Say it with flowers — via MicroLink!
Send your order now using this simple
form and fresh flowers or plants will
be delivered to any address in the UK
or Eire. Send before 12 noon and they
will be delivered the same day except
Saturdays and Sundays - with the help
of 2,700 florists who form Interflora

*******************************
      Floral Selection
*******************************
1. Gift-wrapped mixed bouquet...#9.90
2. Plain-wrapped cut flowers....#7.90
3. Arrangement of cut flowers..#10.90
4. Floral wreath..............#13.90
```

magic words that will allow you to use the mainframe's facilities.

However most subscriptions are remarkably cheap and, with some systems at least, you can often access the mainframe for the price of a local call, wherever it is.

So far I've only used Tellstar to access one such system, MicroLink, which is part of Telecom Gold. MicroLink has all sorts of facilities from electronic mail to free software, from a teleflora service for sending flowers (honest!) to news pages.

It was simple to get on MicroLink using Tellstar, but it did involve me reconfiguring the RS423. And that was easier to do than to spell.

All I have to do was to select the Initialise option from the main menu and then pick my new settings (gleaned from the MicroLink manual, which is one manual I do have) from those options offered me on a second menu.

Again it was easier done than said. Once that was done I was back at the main menu. I then phoned up the computer, on a local number even though it's miles away, selected chat mode – again at the touch of a key – and when it had answered and I'd identified myself, I was away.

As I said, all sorts of facilities are available on MicroLink but I normally stick to sending messages to other users via their mailboxes.

Now if I were restricted to just typing in my letters it would be a bit slow and the phone bill would mount up (Tellstar displays a little clock in the top right hand corner of the screen to remind you that tempus is fugitting away).

Here another aspect of terminal mode comes into play. This allows you to use either disc or tape to hold a file such as a letter.

Then when you've got through to a mainframe and you want to send the file you can go back to the main menu (always available with the Escape) and call up the file at the touch of a key.

Alternatively you can load the file into the Electron's main memory, called a buffer for these purposes, and output from this when needed. It's a lot faster than typing.

You can also use the buffer or disc to store incoming files for viewing later when the phone bill isn't mounting. You can even get hard copy if you've got a printer.

Screen 6 shows a buffer full of MicroLink messages.

While it's one of those things that you may not see the point of at first, this use of disc and buffering gives Tellstar great flexibility and enhances its usefulness.

And that's where we come to the end of our discussion of terminal mode. We've seen four of its uses but, believe me, there are lots more.

However now it's time to turn to the second of Tellstar's modes, the Prestel one.

Prestel is another of British Telecom's computer systems, dedicated to providing a view-data service to users.

Basically this means that it is a huge database full of "pages" of information which are displayed, upon request, a screenful at a time rather like the Ceefax or Oracle pages you'll see on your TV.

In Prestel's case the information is coming over the telephone wires, not down the TV aerial, but the resulting screens look the same.

The big difference is that you can use the phone lines to interact with Prestel and obtain the screens you want without having to wait for them to cycle round.

Getting into Prestel via Tellstar is easy. You press P for Prestel at the main screen and you get another, similar, screen with Prestel Emulation written at the top.

You can now go into Prestel by dialling the computer, running the gauntlet of its security checks – it's another subscription service – and you're away.

Selecting Prestel mode has taken care of all the settings automatically.

You're now free to explore Prestel which, as it's so huge, is a life long task.

And considering that some of its sections are as user friendly as Attila the Hun, it's just as well that Tellstar's Prestel emulation sets up the function keys to do some very useful things.

The most useful of these is to "tag" a page. Once you've done this you can retrieve that page from anywhere inside Prestel at the push of a function key.

In fact you can have several tagged pages, all of which can be retrieved in order.

Take my advice and tag the main menu so you can always get back to it. In fact, at first, if you see a menu, tag it. This will save much wailing and gnashing of teeth.

The next most useful function key is the one that sends a copy of the screen to your filing system. These screens

can later be loaded into Tellstar's buffer and Viewed, saving telephone bills.

Other keys take you back to the previously accessed page, send Escape characters to Prestel – when you need to use it, you'll know why it's there – and to download software.

As yet there isn't any Electron software available on Prestel to download but I did try.

I entered the Micronet section of Prestel and downloaded a BBC Micro program successfully. However the program was one that wouldn't work on the Electron. Still, the downloading worked.

It's a bit like saying the operation was a success but the patient died! However I have little doubt that soon Micronet will have software available for Electron users.

As I've said, Prestel isn't the easiest of systems to use, but having Tellstar makes things a lot easier.

Having said that, there is one small drawback to the Tellstar Prestel emulation. It's in black and white, not colour.

This is because the Electron doesn't have the BBC Micro's Mode 7 teletext graphics and so has to do the best it can. And, sadly, this won't stretch to colour.

I don't find this a drawback. After all Electron users don't need the horrible garish colours used to satiate jaded BBC Micro users, do they?

Considering that Tellstar is the only communications package currently available for the machine, Electron users could have found themselves with an inferior package, offered on a take it or leave it basis.

Happily this is not the case, and Pace has produced a first rate package, every bit as good as the BBC Commstar version, if less colourful.

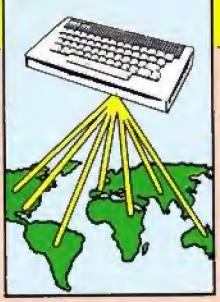
Getting into communications can be difficult, but with its wise choice of default settings and it's easy-to-use, menu driven operation, Tellstar makes it as simple as possible.

Given this and its flexibility and wide scope, I have no hesitation in recommending Tellstar to any Electron user interested in communications – especially to those who know little or nothing about the subject.

In fact, with the way Electron prices have gone, I recommend the whole package – Electron, Plus 1 and Tellstar – to anyone who wants to join the telecommunications revolution.

It's a first rate package, powerful, versatile, yet straightforward.

In fact, considering the way it allows your Electron to access the outside world, it must be the ultimate Electron expansion.



Gear up your Electron and communicate!

COMMUNICATIONS is, perhaps, the most interesting area of microcomputing that has yet to be explored by the majority of home computer users.

For many years now the public telephone network has been used to transfer data between computers which are often many hundreds of miles apart.

For companies using computers in this way the advantages are obvious.

Large volumes of data, including programs, can be transferred between various establishments very rapidly and without the necessity to physically transport discs, tape or any other storage media.

It is only recently however that the additional equipment – both hardware and software – that was needed to take advantage of the telephone in this way has become sufficiently inexpensive to be used widely in the home.

So let's examine the possibility of using the Electron to communicate via the telephone system.

There are many advantages in doing so.

One major application is the ability to access data which is held on other, often very large, computer systems.

The best known example of this is British Telecom's Prestel service, although many other public database systems exist.

This is an area which is currently arousing great interest, and which will no doubt become one of the more significant aspects of computing in the future.

The transfer of files to other computers, in the same way as is done between mainframe installations, is another area that has great potential in the home.

You've just written a new utility program which you would like a friend, who happens to live at the other end of the country, to test for you.

Instead of sending a tape or disc, which could take days to arrive, you could simply send a copy of the file over the telephone in the space of a phone call.

This applies not only to another Electron. You could just as easily transfer a program to an Apple for example, although it would almost certainly require modification before it could be used.

Another type of system, the "bulletin board", is peculiar to micros.

Bulletin boards were first developed in America where micro communications has progressed to a more advanced state than in Europe.

It is simply a micro which accepts telephone calls from other micro users and allows them to access its files, download programs, and, as with electronic mail systems, leave messages for other callers.

It is quite common to find that such systems operate on a worldwide basis with users calling from countries as far apart as Australia, Britain and America.

These are just a few of the possible applications. But what about the equipment required to use the telephone network in this way?

Fortunately the rapid development of large and very large scale integration technology in recent years has made it possible to produce suitable equipment at prices which are no longer prohibitive.

The obvious starting point is some form of interface, in the same way that a disc interface is required before data can be stored onto and retrieved from a disc drive.

This interface is normally an RS232 or RS423 serial port, and it provides the first link in the communications chain.

The reason for using the RS423 serial port, as opposed to a parallel port such as that used with Centronics-type printers, is fundamental to the whole area of long distance transmission of data.

Since the telephone network uses only two, three or four wire circuits, data must be transferred in serial form, one bit at a time, in sequence.

However data within a computer is transferred between different components in parallel.

This means that in an 8 bit machine such as the Electron, eight individual wires, known collectively as the data bus, are used to move information around a byte at a time.

This is termed parallel transfer because eight bits are transferred simultaneously.

We have noted that the primary reason for serialising data for transmission over the telephone network is simply that there are insufficient wires to transmit eight bits at a time.

Indeed, it would be extremely expensive to lay eight cables instead of one, and even if this were possible there are further complications with respect to parallel data transfer.

These revolve around the fact that the individual bits of data tend to travel at different speeds within the wires and introduce what is known as data skew. The result is that

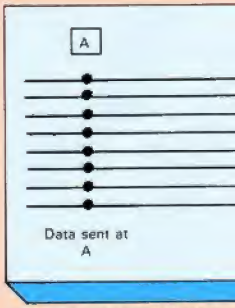


Figure I: Data skew in parallel transfer

the data becomes garbled.

This effect, illustrated in Figure I, is more noticeable over greater distances.

It is one of the reasons that data cables used with parallel printers or disc drives are rarely longer than about a metre.

We see then that the function of a serial interface is to convert data from a computer into serial form so that it may be transmitted via a circuit consisting of as little as two wires.

The parallel transfer of n data bits requires n+1 individual wires, n wires for the data and one ground line.

In addition to the obvious economies of using fewer wires, serial data may be transmitted over longer distances than is possible with a parallel interface due to the absence of the skew effect in serial circuits.

What are the other components of a communications system?

Consider the type of signals that a computer generates. These are digital in nature.

The 1s and 0s are represented by two separate and distinct voltage or current levels, generally the former.

The public telephone network however was developed for a different application – the transmission of the human voice which is analogue, as opposed to digital, in nature.

The difference between the two types of signal, analogue and digital, can be seen in Figure II.

The point is that the square waveform produced by digital computers will not pass through the telephone network because of the nature of the network itself and various filters and switching equipment used in telephone exchanges.

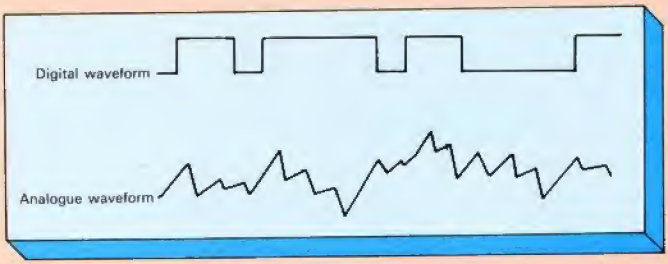


Figure II: Analogue and digital waveforms

To overcome this problem a further piece of equipment is required that will convert digital data into analogue form so that it can then be transmitted via the telephone network.

This task, termed modulation, is the function of a modem.

In practice a modem carries out two jobs. Digital data for transmission is modulated into analogue form before being passed to the telephone system.

Conversely, received analogue data is demodulated into digital form before being given to the computer.

Hence a modem is used to both *MO*dulate and *DEM*odulate electrical signals.

The final element involved is the software.

The facilities offered by communications software may vary greatly, but essentially it provides the means by which the serial interfaces, and the data passed between them, can be controlled.

Just as a disc filing or disc management system is used to store and retrieve information from disc, communications software may be regarded as the communications management system.

Thus, although the hardware provides the physical means by which data and files can be transferred, some form of protocol is required in order that each computer can understand and use the signals it receives from the other.

These protocols may be regarded as the equivalent of word, sentence and paragraph structure in a spoken language.

In the case of written text punctuation is used in order to ensure that it makes sense to the reader. Similarly a protocol structure of some form is required to allow two computers to communicate sensibly with each other.

It is the software that provides this structure, along with the facilities for storing and manipulating received data or data to be transmitted.

So we can see that three basic elements, apart from the computer, must be present in a communications system using the telephone network – a serial interface, a modem and the appropriate software.

On a smaller scale, within a particular room for example, it is perfectly possible to link the two computers together without using the telephone system.

In this case a direct wire link between the two serial interfaces is sufficient to allow communication to take place and no modulation is required.

Provided that the distance between the computers is not too great there should be no problems.

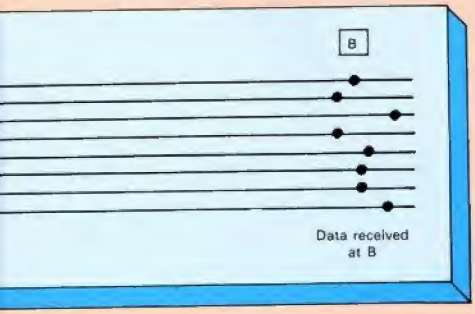
Using a hard-wired link in this way, however, reveals a further advantage of using the telephone system.

When a hard-wired connection is used only the two computers involved can communicate with each other.

The telephone system, however, offers far greater flexibility in that any two computers with access to a phone may be linked.

Communication between the Electron and almost any other type of mainframe, mini or micro is possible, so try it.

Serialise, modulate and communicate!



Find out how YOU can join in the comms revolution!

Turn to Page 55

COMMUNICATIONS with your micro brings with it a whole new language and terminology. Here's our at-a-glance glossary to help you through the jungle.

What it's all about...

A

Asynchronous: Method of transmitting data from one receiver to another. It can be inefficient as each eight bit character requires an identifying sign preceding and following the string. In this case the receivers do not have the same time clock. *(See Synchronous.)*

Ascii: The industry de facto standard alphabet code for transmitting letters and numbers. It stands for American Standard Code for Information Interchange.

B

Baseband: Low frequency data transmission system which is relatively slow as the narrow frequency range allows it to transmit only one message at a time.

Broadband: High frequency data transmission system – such as certain types of cable used in cable TV – which can have several channels transmitting data at different frequencies and at high speeds.

Baud: Measured rate of data transmission in bits per second.

C

CCITT: The body which establishes international standards for communications.

Cabletext: Text service transmitted on cable TV channels which normally uses the teletext character set, as seen on Oracle and Ceefax.

Closed user group: Private "information club" on a public communication system where only those terminals or account holders registered into the system's security levels can access certain pre-determined information.

D

Duplex: A description of the type of transmission taking place between two points on a telecommunication network.

Full duplex means transmission of data both ways simultaneously. Normally characters sent from a keyboard are echoed back to check that what the transmitting terminal sent was actually correctly received.

Half duplex is transmission of data in both directions but only one way at any one time.

Simplex means transmission in only one way at any time.

E

Electronic mail: Telecommunication system which can receive, store and forward, messages sent from one terminal to a system user address.

G

Gateway: Link between one telecommunication system and another.

I

Information Provider: User who supplies and maintains a section of information on a database. This can be an individual or a large organisation.

Intelligent terminal: Put simply a micro. It is defined as a terminal which provides a user with computer processing locally rather than remotely.

Integrated digital network: System where all messages are sent in digital form. It can handle all the basic telecommunication requirements – voice, data, telex, fascimile and so on.

Interactive: When a database service is used in such a way that information or data can be manipulated once it has been transmitted or during transmission. Also where a user can modify, amend and respond to information – for example, interrogate, command or leave messages.

IRC: Information retrieval computer within a network.

M

Modem: Stands for modulator-demodulator. It converts digital data into analogue voice transmission – which is what the public telephone network was designed for. It can be asynchronous or synchronous.

Multiplex: Device which combines the data from several terminals into one composite data stream for transmission over a single communication link. At the receiving end another multiplexor splits the stream to reconstitute the original transmission from each terminal.

N

NUA: Network User Address. Normally a unique number which will identify a call to a particular terminal – or in many cases a database – and identify that calling terminal for billing purposes.

NUI: Network User Identity – identifies a terminal when it first logs onto a network.

O

OSI: Open systems architecture designed so that a network can transmit data between differing terminals. It sets an international standard of seven layers of communication protocols. Thus far only three have been universally implemented.

P

PAD: Data packet assembler/disassembler. Enables differing types of terminals to access a network whatever their characteristics of data transmission.

Packet switching: A network technique for breaking long messages into small blocks of data for onward transmission, thus avoiding congestion at differing parts of the network.

PSS: The packet-switching network – used by Micro-Link and Telecom Gold.

Parallel: Method of data transmission in which the different bits making up a character are transmitted simultaneously by different routes.

Protocol: Method of data transmission which meets an established standard between similar systems.

S

Synchronous: Method of sending data when both terminals are regulated by having a common time clock. Once both are sychronised transmission can be very fast without the need for identifiers at the beginning and end of each block.

SNA: Series of network standards and protocols originally proposed by IBM which it is attempting to get internationally accepted.

T

Teletext: Communications system which uses modified terminals, in most cases a TV set, to receive text and graphics on that part of the transmission system not used for broadcast TV.

V

Viewdata: System which allows modified terminals to be used to receive and react to text and graphics held on a common database with the data being sent over the telephone network.

Videotex: Generic term encompassing both teletext and viewdata.

VANS: Valued Added Network Licence permitted by the Government following the de-regulation of British Telecom. Organisations which wish to store and forward data over the public telephone system have to apply for a VANS licence.

Now you can link your Electron to the telephone, here's how to make the most of your new hobby!

No. 1

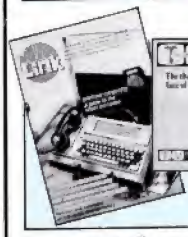
Special supplement: Guide to Microcomputing on Prestel. Contains hundreds of page numbers covering games, education and business and utility programs for the BBC, Apple, Commodore and Spectrum. Plus hints, tips and reviews of comms products.

No. 2

Special supplement: Guide to Communicating with your Micro. All you want to know about user-to-user communications, protocols, how modems work, an introduction to networking and PSS. Plus a guide to 39 modems listing all their special features.

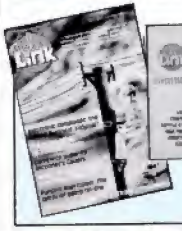
No. 3

Special supplement: Guide to Bulletin Boards in the UK. An in-depth survey of what bulletin boards offer and what they cost, how to access them, interviews with 12 leading sysops. Plus a complete listing of 39 bulletin boards, pinpointed on a map of the UK.



No. 4

Includes the first Teletext & Viewdata News, highlighting all the latest industrial news. Plus features on financial, legal and educational databases, start of a guide to Knowledge Index, how to work out your phone bill and a survey on portable micros with comms facilities.



No. 5

Special supplement: Guide to Communications Software. A survey of 37 communications software packages for 11 of the most popular micros. Plus advice on viewdata graphics, description of the de facto standard for UK bulletin boards, Xmodem, and online humour from Punch editor Alan Coren.

No. 6

Special supplement: Guide to teletext page design. A leading expert tells how to achieve eye-catching viewdata graphics. Plus all about coin-operated Prestel, setting up educational viewdata systems, using packet radio to cut phone bills, on-line credit reporting.

No. 7

Special supplement: Guide to using electronic mail. A detailed expert introduction to electronic mail's time-saving and cost-cutting features. Plus a challenge to Prestel's monopoly, launch of the BBC's Datacast, interview with a top US hacker, and how Farmlink is branching out.

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MATHS WORKOUT

MIKE BIBBY looks at how the Electron does its sums

Inside story of binary operations

BINARY numbers can be added and subtracted just as our more familiar decimal numbers are. And, of course, we can multiply and divide them.

There are, however, other ways of combining two binary numbers that are extremely useful in dealing with computers. They're also easy to use, so let's have a look at them.

Firstly, we'll see how we can NOT a binary number – simple, one-bit numbers first. By the way, we're going to be dealing exclusively with binary numbers this month, so we can drop the % sign.

The rules for doing a NOT are simple:

- **If the bit is 1 then it becomes 0**
- **If the bit is 0 then it becomes 1**

If you like, the NOT converts a bit into its opposite.

So **NOT 1 = 0**
And **NOT 0 = 1**

Why do we use the word NOT? Well, mathematicians often use the number 1 to mean TRUE and 0 to mean FALSE.

So NOT 1 means NOT TRUE, which means FALSE, which is 0. That is, NOT 1 is 0. And, as NOT FALSE is most certainly TRUE, NOT 0 is 1.

If we are to NOT a binary number consisting of several bits, we simply apply the rule for NOT to each bit individually.

So **NOT 10110010**
becomes **01001101**

Some people think of this process as "turning the number on its head" – so it's sometimes called inverting. Others call it taking the complement of the number.

NOT just works on a single binary number. However, there are other sums or operations that have a set of rules for combining two binary numbers.

For instance we can AND two binary numbers. Let's look at the rules for ANDing a single bit with another bit.

When you think about it, there are four possible combinations of bits that we could AND: 0 with 0, 0 with 1, 1 with 0 and 1 with 1.

We write that we are ANDing, say, 0 with 1 as 0 AND 1.

The rules for ANDing are:

0 AND 0 = 0 (case a)
0 AND 1 = 0 (case b)
1 AND 0 = 0 (case c)
1 AND 1 = 1 (case d)

Notice that the only time the result is 1 (TRUE) is when the two bits ANDed are both 1 (TRUE). This helps us to see why we use the word AND to describe the operation.

If you think of the first bit as "this" and the second bit as "that", what we're doing when we're ANDing is asking whether "this and that" is true.

"This and that" can only be true when both "this" is true AND "that" is true – hence the use of AND to describe the process.

For example, consider the statement that it is

dry and sunny

This is true only if dry is true and sunny is true (case d).

If either of the two (or both) are false (cases a, b, c) the whole statement is false, since it isn't both dry and sunny.

We can AND pairs of binary numbers of more than one bit – just apply the rules of ANDing to each bit individually.

For example:

10010110
AND 10110011
gives **10010010**

We can also OR two binary numbers. The rules for ORing a single bit with another bit are as follows (again there are four possible combinations):

0 OR 0 = 0 (case e)
0 OR 1 = 1 (case f)
1 OR 0 = 1 (case g)
1 OR 1 = 1 (case h)

In this case, you only get a FALSE result (0) when both bits are FALSE. If either or both bits are TRUE (1) the result is TRUE. It's easy to see why we use OR to describe this. If one, OR the other, OR both is true the whole thing is true!

Let's use the meteorological analogy again. Let's consider the statement that it is

dry or sunny

This is only FALSE when it is NOT dry and NOT sunny (case e), otherwise it is TRUE (cases f, g, h).

To sum up, with OR, the whole thing is true if either or both the things being ORed is true.

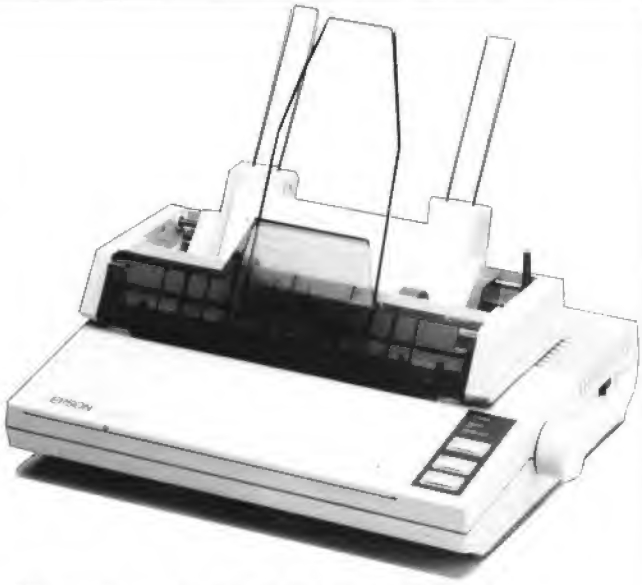
As we did with AND, we can OR pairs of numbers with more than one bit – we just apply the rules of ORing to each bit individually.

For example:

10010110
OR 10110011
gives **10110111**

● *In the next article we'll look at EOR, and the use of masks.*

Readers new to binary numbers might find Mike Bibby's easy to follow introduction to them in the April, May and June issues of *Electron User* in 1984 helpful



This LX80's a lovely little mover

By IAN WHITMORE

THE LX80 is Epson's newest low cost dot matrix printer which, in addition to the usual facilities, has near letter quality printing.

It is smaller, neater and lighter than its worthy predecessors. The all important dip switches are accessible from the outside of the case and will set start up options for international character set, paper out indication, form length, NLQ or draft mode, character width, beeper on/off, carriage return with or without linefeed, printer active/deactive and open or slashed zero.

In its basic form the LX80 only possesses friction feed, but a neat tractor unit that sits on top of the printer and takes only a few seconds to fit is available as an extra at low cost. This tractor unit accepts paper from four to ten inches in width and has one particularly nice feature – the friction feed must be set to "free" in order to install the tractor unit, so that one cannot get paper torn because both drives are active.

However there is no protection at the rear of the tractor unit so that paper already printed can get caught up in the rear of the mechanism. Loading paper is easy, with or without the tractor feed.

Epson also offers a very low priced single sheet feeder which I have not had the opportunity to try. Paper tear off facilities do not exist, so that the continuous roll user will have to get used to using scissors.

Epson have departed from the long ribbon cartridge that was characteristic of MX, RX and FX printers, the LX80 having a four inch square cartridge which clips on to, and moves with, the print head.

Although it doesn't last as long as the traditional type, the replacement cost at the moment (only Epson make the cartridges) is the same. When second sources become available no doubt the price will fall.

One great advantage of the new system is the ribbon guide, which prevents the ribbon touching the paper during paper loading or paper feed. No more messy black smudges.

All the usual print facilities are supported, such as enlarged, emphasised, condensed, double-strike, underlined, italic, unidirectional, superscript and subscript – the majority being available in pica and elite sizes (see Figure I).

Although proportional spacing and reverse paper feed are not present (only on the FX80), five line spacings, both margin settings, vertical and horizontal tabulation, perforation skip, and form length setting are all supported. Buzzer, paper end detector, sheet paper feeder (when fitted), delete, backspace, half speed and reinitialise are all software accessible.

One feature in common with the FX80 is the master select facility, in which several commands may be given at one time by setting different bits in the command character. Also many print modes may be selected by Epson's Selecttype in which the on-line, line feed and form feed buttons are used.

Although this is clever I found it difficult to be certain that I had the complex sequences right, there being no indication of the mode selected until printing was started.

The best feature, and the newest for Epson in a budget priced printer, is the NLQ print face available. This is really superb as Figure II shows.

NLQ is approximately a

This is draft mode

This is emphasised

This is enlarged

This is condensed

This is double strike mode

This is underlined italic

this is superscript and subscript

This is elite size

Figure I: Styles of printing

From Page 19

sixth of the draft mode speed. It supports a justification facility, offering left, right or full justification and centering. Emphasised printing is also possible, but most other typeface options are not.

Eleven international character sets are supported, being selected by dipswitch or software. These sets are also supported in NLQ mode.

Thirty two preset graphics characters are present in the LX80 (see Figure III) and they may be modified to change pitch and weight by combination with enlarged, emphasised, pica and so on. In most cases the characters are contiguous horizontally, but line spacing needs to be altered in order to join successive lines of characters.

```
This is NLQ printing
This is emphasised NLQ
```

Figure II: Near letter-quality printing

In common with the FX80, programmable characters are supported but only six in number. However these can be designed in both draft and NLQ modes.

All the graphics modes present in RX80 and FX80 printers are supported in the LX80. All the various dumps I have tried work well, including Mini Office.

The buffer in the LX80 is only small, taking only about half of one A4 page and disappearing when characters are redesigned. When compared with the RX80 and FX80 on a speed test the LX80 took only 58 seconds in draft mode against the RX80's 75 and the FX80's 53 seconds.

The manual is a great improvement on its predecessors, being written in English English as opposed to the Japanese printer dialect I Many examples of the various facilities are given after careful explanation of their function.

A number of appendices contain a detailed breakdown of the codes, in Ascii, decimal, hexadecimal and control formats. The Ascii codes and character fonts are listed and the software commands are listed in numerical and function order.

The dip switches, technical specification, parallel interface protocols and tractor unit are all detailed, and an especially helpful section on trouble-shooting and matching different computer systems is also present.

The pull out reference card with all commands and the Ascii character sets is, however, let down by the absence of decimal codes, which would have been of value to some users.

VERDICT: All in all Epson have produced a great new little printer, but I wish they had designed a tractor mechanism into which the paper could not re-enter. A tear off facility would also help. Still, highly recommended.

Figure III: Graphic codes available

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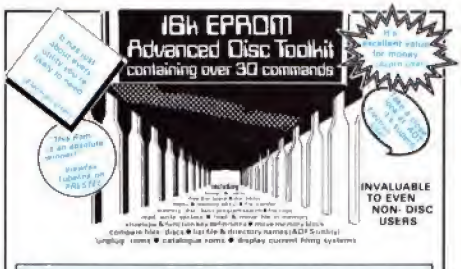

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You must give the computer instructions in the form of simple one or two word sentences such as GET TORCH or THROW ROPE.

All instructions must be in capitals only. If your command is not understood then try saying it in a different way.

The data has been coded by shifting the Ascii value of the descriptions in the data statements, which makes it more difficult to solve the game by examining the listing.

Take extra care when entering these lines.

Necromancer listing

```
  10 REM The Necromancer
  20 REM Version 1B
  30 REM By S.M.Lucas
  40 REM (c) Electron User
  50 PX=5:SX=0:MODE 6:VDU1
9,0,4,0,0,0:aa$="You can't
go that way!":ab$="O.K.":ac
$="Don't be ridiculous":ad$
="The bridge comes down.":a
e$="You don't have thea."
  60 PRINTTAB(12,2)"The Ne
cromancer"''''SPC4"An advent
ure game by S.M. Lucas"
  70PRINT'''"For many year
s past, the villagers have
been terrorised by the evil
 Necromancer,who has stolen
 all their money."
  80PRINT'''"Your task is t
o search the land, recovert
he treasure and return it t
o the       mansion where y
ou start."
  90VDU23,1,0;0;0;0;
 100 DIM S%(48,3),Q$(48),V
$(5),G$(23),B%(23),N%(23),M
%(23),A%(23)
 110 FORI=1TO48:READQ$(I):
T$=Q$(I):PRODCode:Q$(I)=H$:
FORY=0TO3:READS%(I,Y):NEXTY
,I
 120DATA JO!B!TNBMM!RVBSSZ
/,0,7,2,0,PO!B!OBSSPX!GPPUQ
BUI!BU!UIF!CPUUPN!PG!B!TUFF
Q!DMJGG/,0,0,3,1
 130DATA BU!UIF!UPQ!PG!B!E
JTVTFE!NJOFTIBGU/,0,0,0,2,J
O!B!TNBMM!CPBUZBSE/,0,10,5,
0
 140DATA PVUTJEF!BO!PWFSHS
PXO!NBOTJPO/,0,0,0,4,JO!B!M
BSHF!IBMMXBZ/!UIF!TUBJST!IB
WF!!!!!DPMMBQTFE/,0,11,0,0
 150DATA PO!B!OBSSPX!GPPUQ
```

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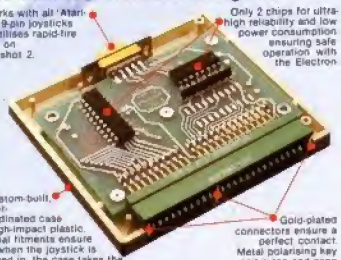

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From Page 23

```
BUI/,1,0,0,0,JO!B!TNBMM!TRV
BSF/!B!MBSHF!PQFO!HBUF!!!!T
UBOET!UP!UIF!XFTU/,0,13,9,7
  16@DATA PO!B!MBOEJOH!TUBH
F/!B!TNBMM!CPBU!JT!!!!!NPPS
FE!IFSF/,0,0,0,8,PO!B!TNBMM
!KFUUZ/!B!CPBU!JT!NPPSFE!IF
SF/,4,14,0,8
  17@DATA JO!B!LJUDIFO!GVMM
!PG!SVCCMF/,6,0,0,0,PVUTJEF
!UIF!GBOUPSZ/!UIF!HBUFT!BSF
!!!!!!MPDLFE/,0,0,13,0
  18@DATA BU!UIF!CPUUPN!PG!
B!GMJHIU!PG!TUFQT/,0,0,0,12
,PO!UIF!CBOLT!PG!B!GBTU!GMP
KJOH!SJWFS/,18,0,0,0
  19@DATA JO!B!GJFME!PG!QPO
QJFT/,0,21,16,14,PVUTJEF!B!
TNBMM!DPUUBHF/,0,0,0,15
  20@DATA BU!UIF!FDE!PG!B!T
IPQQJOH!NBMM/,0,23,18,0,JO!
B!OBSSPX!BMMFZIBZ/!TUFQT!MF
BE!EPXO/,0,24,19,17
  21@DATA BU!UIF!FDE!PG!B!O
BSSPX!SMMFZ/,0,0,0,18,JO!B!
GPSFTU!HMBEF/!B!UBMM!USFF!T
UBOET!!!IFSF/,0,0,21,0
  22@DATA BU!UIF!TUBSU!PG!U
IF!GPSFTU/,15,26,0,20,JO!B!
TNBMK!SPPN/!BO!PME!NBO!TMFF
QT!JO!!!IJT!DIBJS/,0,0,0,0
  23@DATA JO!B!TIPQQJOH!NBM
M/!BMM!UIF!TIPQT!BSF!!!TIVU
/,17,27,0,0,JO!B!OBSSPX!QBT
TBHFXBZ/,18,0,0,0
  24@DATA JO!B!OFTU!BU!UIF!
UPQ!PG!B!USFF/,0,0,0,0,JO!B
!DMFBSJOH!JO!UIF!GPSFTU/,21
,0,0,0
  25@DATA PVUTJEF!B!TNBMM!T
IPQ/,23,0,0,0,0,BU!UIF!FDE!PG
!B!OBSSPX!QBTTBHF/,24,0,29,
0
  26@DATA PO!B!NPVOUBJO!QBU
I/,0,0,30,28,CZ!B!NPBU/!UIF
SF(T!B!ESBXCSJEHF!IFSF/,0,0
,31,29
  27@DATA JO!B!EBSL!BOE!HMP
PNZ!DPVSUZBSE/,0,36,0,38,JO
!B!UJOZ!TUPSFSPPN!GVMM!PG!T
UBUVFT/,0,0,0,31
  28@DATA JO!B!TNBMM!TIFFU!
TIPQ/,0,0,0,0,BU!UIF!CPUUPN
!PG!UIF!EBSL!UPXFS/,0,0,35,
0
  29@DATA PO!B!OBSSPX!ESBXC
SJEHF/,30,48,0,34,PVUTJEF!B
!TNBMM!DPUUBHF/,31,41,0,0
  30@DATA JO!B!TNBMM!SPPN!S
VMM!PG!TNBMM!TOJEFST/,0,0,0
,0,JO!B!MPOH!XJOEJOH!QBTTBH
F/,0,44,39,0
  31@DATA TUBOEJOH!OFYU!UP!
B!MBSHF!TUBUVF/,0,45,40,38,
JOTJEF!UIF!DBTUMF!XBMMT/,35
,46,0,0
  32@DATA JO!B!TNBMM!WJMMBH
F!TRVBSF/,36,47,42,0,TUBOEJ
OH!PVUTJEF!UIF!HSBWFZBSE!HB
UFT/,0,48,0,41
  33@DATA PO!B!TNBMM!JTMBOE
!JO!UIF!NJEEMF!PG!UIF!!MBLF
/,0,0,0,0,PO!UIF!CBOLT!PG!B
!WBTU!VOEFSHSPVOE!MBLF/,38,
0,45,0
  34@DATA JO!B!EBSL!BOE!HMP
PNZ!DBWFSO/,39,0,0,44,JO!BO
!PWFSHSPXO!KBSEFO/,40,0,0,0
  35@DATA PVUTJEF!UIF!CMBDL
TNJUI(T!TIPP/!JU(T!!!!!DMPT
FE!BU!UIF!NPNFOU/,,41,0,48,
0,JO!UIF!DIVSDIZBSE/,42,0,0
,47
  36@FORI=1TO23:READG$(X):T
$=G$(X):PROCcode:G$(X)=H$:R
EADBI(X),N$(X):T$=N$(X):PRO
Ccode:N$(X)=H$:NX(X)=X:NEXT
  37@DATA "",25,"",80!FWJM!
USPMM,14,USPMM,B!IPCHPCMJO,
24,IPCHPCMJO
  38@DATA B!WVMUVSF,31,WVMU
VSF,80!FWJM!NPOTUFS,40,NPOT
UFS,B!WFOEJOH!NBDIJOF,41,NB
DIJOF
  39@DATA B!CSPOCF!DPJO,22,
DPJO,"",41,"",B!HMFBNJOH!TI
PSE,3,TXPSE,B!HPMEFO!DBTLFU
,43,DBTLFU
  40@DATA B!GMBNF!UISPXFS,1
2,GMBNF!UISPXFS,B!DSVDJGJY,
48,DSVDJGJY,"",26,"",80!PME
!XJC@SE,26,XJC@SE,B!TJMWFS!
DIBMJDF,32,DIBMJDF
  41@DATA TPNF!GMZTQSBZ,33,
GMZTQSBZ,B!IPSOFUT!OFTU,46,
OFTU,B!NBHJD!KBOE,11,XBOE,"
",46,"",B!WFOPNPVT!TOJEFS,3
7,TOJEFS
  42@DATA B!OBJS!PG!MFBUIFS
!HMPWFT,6,HMPWFT,B!MJU!UPSD
I,22,UPSDI,B!HPMEFO!FBHMF,2
5,FBHMF
  43@CLS:REPEAT
  44@PROCadv
  45@UNTILSZ>9
  46@CLS:PRINTTAB(10);"W e
l l  D o n e!''''You have fo
und all the treasures and
  killed the evil Necromanc
er.":END
  47@ END
  48@ DEFPROCcode
  49@H$="":FORTX=1TOLEN(T$)
:H$=H$+CHR$(ASC(MID$(T$,TX,
1))-1):NEXT
  50@ENDPROC
  51@DEFPROCadv
  52@K=0:A$="":PRINT''You a
re :-''Q$(PX)';:IFSX(PX,0)>0
THENA$="North"
  53@IFPX=3@THENPRINT"A sma
ll lever protrudes from the
wall,"'
  54@IFPX=44ANDAX(12)=0@THEN
X$="A vampire attacks me. I
wish I had      brought so
mething to ward it off with
!":PROClose
  55@IFPX=5THENPRINT"A SIGN
READS 'DROP TREASURES HERE
'."'
  56@IFSX(PX,1)>0ANDLEN(A$)
>0THENA$=A$+",South"ELSEIFS
X(PX,1)>0THENA$="South"
  57@IFSX(PX,2)>0ANDLEN(A$)
>0THENA$=A$+",East"ELSEIFSX
(PX,2)>0THENA$="East"
  58@IFSX(PX,3)>0ANDLEN(A$)
>0THENA$=A$+",West"ELSEIFSX
(PX,3)>0THENA$="West"
  59@IFPX=5ORPX=16ORPX=36OR
PX=27THENAS=A$+",In"
  60@IFPX=6THENAS=A$+",Out'
ELSE IFPX=33ORPX=22ORPX=37
THENA$="Out"
  61@IFPX=13THENA$=A$+",Up"
ELSEIFPX=18THENA$=A$+",Down
"
  62@IFPX<>25PRINT"You can
go :-"'A$'
  630SX=0:IFBX(1)=5THENSX=S
X+2
  64@IFBX(10)=5THENSX=SX+2
  65@IFBX(13)=5THENSX=SX+2
  66@IFBX(15)=5THENSX=SX+2
  67@IFBX(19)=5THENSX=SX+2
  68@EX=0:FORT=1TO23:FX=0:I
FBX(T)=PXTHENFX=1
  69@IFFX=1ANDEX=0@THENPRINT
"You can see :-"'
  70@IFFX=1THENPRINTB$(T):E
X=1
  71@NEXT:INPUT''What do yo
u want to do now *,Z$:VDU7:
C$=LEFT$(Z$,3):D$=LEFT$(Z$,
4):CLS
  72@IF(C$="N"ORD$="GO N")A
NDSX(PX,0)>@THENPX=SX(PX,0)
:K=1ELSEIF(C$="N"ORD$="GO N
")THENPRINTaa$:K=1
  73@IF(C$="S"ORD$="GO S")A
NDSX(PX,1)>@THENPX=SX(PX,1)
:K=1ELSEIF(C$="S"ORD$="GO S
")THENPRINTaa$:K=1
  74@IF(C$="E"ORD$="GO E")A
NDSX(PX,2)>@THENPX=SX(PX,2)
:K=1ELSEIF(C$="E"ORD$="GO E
")THENPRINTaa$:K=1
  75@IF(C$="W"ORD$="GO W")A
NDSX(PX,3)>@THENPX=SX(PX,3)
:K=1ELSEIF(C$="W"ORD$="GO W
")THENPRINTaa$:K=1
  76@IFC$="CLI"THENPROCa EL
SEIFC$="UP"THENPROCb ELSEIF
C$="DOW"THENPROCc ELSEIFC$=
"IN"THENPROCd ELSEIFC$="OUT
"THENPROCe
  77@IFC$="GET"ORC$="TAK"TH
ENPROCf ELSEIFC$="INV"THENP
ROCh ELSEIFC$="DRO"ORC$="LE
A"THENPROCi ELSEIFC$="SWI"T
HENPROCj
  78@IFC$="ROW"ORC$="SAI"TH
ENPROCk ELSEIFC$="PUL"THENP
ROCl ELSEIFC$="WEA"THENPROC
m ELSEIFC$="PLU"THENPROCn E
LSEIFC$="JUM"THENPROCo ELSE
IFC$="SCO"THENK=1:PRINT"You
 have scored ";SX;" out of
10."
  79@IFC$="SPR"THENPROCp EL
SEIFC$="INS"THENK=1:PROCq E
LSEIFC$="TRA"THENK=1:PROCr
ELSEIFC$="REL"THENK=1:PROCs
  80@IFC$="STA"THENPROCt EL
SEIFC$="USE"THENK=1:PROCu E
LSEIFC$="GIV"THENK=1:PROCv
ELSEIFC$="THR"THENK=1:PROCw
  81@IFC$="HEL"ANDPX<>31THE
NK=1:PRINT"I've not a clue
what to do here!" ELSEIFC$=
"PRA"THENK=1:PRINT"That made
 me feel better." ELSEIFC$
="HEL"THENK=1:PRINT"It does
n't like light!"
  82@ IF C$="LOO" THEN PRIN
T"You see nothing special."
:K=1 ELSE IF C$="SAV" THEN
K=1:PROCsave ELSE IF C$="LO
A" THEN K=1:PROCload
  83@IFC$="QUI"THENK=1:PROC
quit
```

From Page 25

```
  840IFK=0PRINT"I'm sorry I
 don't understand you!"
  850 ENDPROC
  860DEFPROCa
  870K=1:IFPX<>20THENPRINTa
c$ ELSEPX=25:PRINTab$
  880ENDPROC
  890DEFPROCb
  900K=1:IFPX<>13THENPRINTa
c$ ELSEPX=18:PRINTab$
  910ENDPROC
  920DEFPROCc
  930K=1:IFPX<>18THENPRINTa
c$ ELSEPX=13:PRINTab$
  940ENDPROC
  950DEFPROCd
  960K=1:IFPX=5THENPX=6:END
PROC ELSEIFPX=16THENPX=22:E
NDPROC ELSEIFPX=36THENPX=37
:ENDPROC ELSEIFPX=27THENPX=
33:ENDPROC
  970PRINT"You can't!":ENDP
ROC
  980DEFPROCe
  990K=1:IFPX=6THENPX=5:END
PROC ELSEIFPX=22THENPX=16:E
NDPROC ELSEIFPX=37THENPX=36
:ENDPROC ELSEIFPX=33THENPX=
27:ENDPROC
 1000PRINT"You can't!":ENDP
ROC
 1010DEFPROCf
 1020K=1:PROCq
 1030IFLX<1ENDPROC
 1040EX=0:FORI=1TO23:IFBX(X
)=PXANDNX(R)=X THENEX=1
 1050NEXT:IFEX=0ENDPROC
 1060IFR=20RR=30RR=40RR=50R
R=60RR=140RR=200RR=23THENPR
INTac$:ENDPROC
 1070AX(R)=1:EX=0:FORX=1TO5
:IFV$(X)=""THENV$(X)=G$(NX(
R)):EX=1:X=6
 1080NEXT:IFEX=0PRINT"Your
hands are full!":ENDPROC
 1090BX(NX(R))=0:ENDPROC
 1100ENDPROC
 1110DEFPROCg
 1120L$="":IX=INSTR(Z$," ")
:R=0:LX=0:L$=RIGHT$(Z$,(LEN
(Z$)-IX))
 1130IFLEN(L$)<2THENRETURN
 1140FORI=1TO23:IFLEFT$(N$(
X),LEN(L$))=L$THENLX=1:R=I
 1150NEXT:ENDPROC
 1160DEFPROCh
 1170K=1:EX=0:PRINT"You are
 carrying :-":FORX=1TO5:IFV
$(X)<>""THENPRINTV$(X):EX=1
 1180NEXT:IFEX=0THENPRINT"N
othing at all"
 1190IFAX(21)=2THENPRINT"Yo
u are wearing the gloves."
 1200ENDPROC
 1210DEFPROCi
 1220K=1:PROCg:IFLX=0THENPR
INT"You don't have ";L$:END
PROC
 1230EX=0:FORX=1TO5:IFV$(X)
=G$(NX(R))THENV$(X)="":EX=1
 1240NEXT:IFEX=0THENPRINT"Y
ou're not carrying ";L$:END
PROC
 1250BX(NX(R))=PX:AX(R)=0
 1260ENDPROC
 1270DEFPROCj
 1280K=1:IFPX=43THENPX=44:P
RINTab$:ENDPROC
 1290IFPX=44THENPX=43:PRINT
ab$:ENDPROC
 1300IFPX=90RPX=10ORPX=14TH
ENPRINT"The water's too dee
p!":ENDPROC
 1310PRINTac$:ENDPROC
 1320DEFPROCk
 1330K=1:IFPX<90RPX>10THENP
RINTac$:ENDPROC ELSEPRINTab
$'"You step into the boat a
nd start rowing."
 1340TIME=0:REPEATUNTILTIME
>300:CLS:PRINT"You reach th
e shore and step out.":IFPX
=10THENPX=9ELSEPX=10
 1350ENDPROC
 1360DEFPROCl
 1370K=1:IFPX<>30THENPRINT"
You see nothing to pull her
e!":ENDPROC
 1380IFAX(21)<>2THENX$="You
 receive a fatal electric s
hock!":PROClose
 1390BX(30,1)=35:PRINTad$:E
NDPROC
 1400DEFPROClose
 1410CLS:PRINTX$'''"You are
dead."'''Would you like to
play again (Y/N)"
 1420REPEAT:A$=GET$:UNTILIN
STR("YyNn",A$)>0
 1430IFA$="Y"ORA$="y"THENRU
N ELSEPRINT"Goodbye. Thank
you for playing.":END
 1440DEFPROCa
 1450K=1:PROCg:IFR<>21THENP
RINTac$:ENDPROC ELSEIFAX(21
)=0THENPRINTae$:ENDPROC ELS
EAX(21)=2:PRINTab$:ENDPROC
 1460DEFPROCn
 1470K=1:PROCg:IFPX<>25ORAX
(23)>0PRINT"You can't":ENDP
ROC ELSEBX(23)=0:AX(23)=1:P
RINTab$'"It flies away!":G$
(1)="A DIAMOND":N$(1)="DIAM
OND":ENDPROC
 1480DEFPROCo
 1490K=1:IFPX<>25THENPRINT"
You can't":ENDPROC ELSEPX=2
0:PRINT"You land safely in
a pile of leaves.":ENDPROC
 1500DEFPROCp
 1510K=1:IFAX(16)=0THENPRIN
T"You can't":ENDPROC ELSEIF
PX<>46THENPRINT"nothing hap
pens":ENDPROC ELSEPRINT"You
 kill them all":BX(17)=0:G$
(19)="A LARGE RUBY":N$(19)=
"RUBY":ENDPROC
 1520DEFPROCq
 1530IFPX<>41THENPRINT"Not
here!":ENDPROC ELSEIFAX(7)=
0THENPRINT"You can't":ENDPR
OC ELSEPRINTab$'"The machin
e dispenses":B$(8)="A SPIDE
R TRAP":N$(8)="TRAP"
 1540FORX=1TO5:IFV$(X)=G$(7
)THENV$(X)=""
 1550NEXT:ENDPROC
 1560DEFPROCr
 1570IFPX<>37ORAX(14)>0THEN
PRINTac$:ENDPROC ELSEIFAX(8
)=0THENX$="The spider bites
you....aagghh":PROClose
 1580FORX=1TO5:IFV$(X)=G$(8
)THENG$(8)="A TRAP WITH A S
PIDER IN":V$(X)=G$(8):AX(14
)=3
 1590NEXT:BX(20)=0:PRINTab$
:ENDPROC
 1600DEFPROCs
 1610IFAX(14)=0ORAX(8)=0THE
NPRINT"You can't":ENDPROC E
LSEIFPX<>40THENPRINT"The sp
ider refuses to move":ENDPR
OC
 1620BX(40,3)=39:IFBX(5)=0T
```

```
HENPRINT"Nothing happens":E
NDPROC ELSEBX(5)=0:PRINT"Th
e spider crawls out and bit
es it.":ENDPROC
 1630DEFPROCt
 1640K=1:IFAX(9)=0THENPRINT
"What with?":ENDPROC ELSEPR
OCg
 1650IFR=3ORR=4ORR=5ORR=140
RR=20ORR=23THENX$="A vampir
e bat attacks me from behin
d.":PROCl ose ELSESX(14,2)=1
5:PRINTab$;G$(2)="A DEAD TR
OLL":ENDPROC
 1660DEFPROCu
 1670PROCg:IFR()11THENPRINT
"You can't use ";L$:ENDPROC
 ELSEIFAX(11)=0THENPRINT"Yo
u haven't got it!":ENDPROC
ELSEIFP%()24THENPRINT"Nothi
ng happens.":ENDPROC
 1680G$(3)="A PILE OF SCORC
HED BONES":SX(24,1)=28:PRIN
Tab$:ENDPROC
 1690DEFPROCv
 1700PROCg:IFR()18THENPRINT
ac$:ENDPROC ELSEIFP%()26THE
NPRINT"not here!":ENDPROC E
LSEIFAX(18)=0THENPRINT"How?
":ENDPROC
 1710FORI=1TO5:IFV$(I)=G$(1
8)THENV$(I)=""
 1720NEXT:AX(18)=0:G$(13)="
AN EMERALD":N$(13)="EMERALD
":PRINT"He thanks me and of
fers me an emerald.":ENDPRO
C
 1730DEFPROCw
 1740PROCg
 1750IFR()22THENPRINT"I don
't see such point!":ENDPROC
 ELSEIFP%()31PRINT"That isn
't going to be much good!":
ENDPROC
 1760IFAX(22)=0THENPRINT"Yo
u don't have it!":ENDPROC
 1770IFSX(31,2)>0PRINT"You'
ve already done that!":ENDP
ROC ELSESX(31,2)=32:PRINT"I
t flies away!":BX(4)=0:PROC
i
 1780ENDPROC
 1790DEFPROCsave
 1800PRINT"Please insert ta
pe/disc now :-"
 1810Z=OPENOUT("data")
 1820FOR X=1 TO 48:PRINT#Z,
Q$(X)
 1830FOR Y=0 TO 3:PRINT#Z,S
%(X,Y):NEXT Y,X
 1840FOR X=1 TO 23:PRINT#Z,
G$(X),B%(X),N$(X),N%(X),AX(
X):NEXT X
 1850FOR X=0 TO 5:PRINT#Z,V
$(X):NEXT X
 1860PRINT#Z,P%,S%
 1870CLOSE#Z
 1880PRINT"Data file create
d."
 1890ENDPROC
 1900DEFPROCload
 1910PRINT"Please insert ta
pe/disc now :-"
 1920Z=OPENIN("data")
 1930FOR X=1 TO 48:INPUT#Z,
Q$(X)
 1940FOR Y=0 TO 3:INPUT#Z,S
%(X,Y):NEXT Y,X
 1950FOR X=1 TO 23:INPUT#Z,
G$(X),B%(X),N$(X),N%(X),AX(
X):NEXT X
 1960FOR X=0 TO 5:INPUT#Z,V
$(X):NEXT X
 1970INPUT#Z,P%,S%
 1980CLOSE#Z
 1990PRINTab$
 2000ENDPROC
 2010DEFPROCquit
 2020PRINT"Do you want to s
ave your position first (Y)
es/(N)o ?"
 2030REPEAT
 2040A$=GET$:UNTIL INSTR("Y
yNn",A$))0
 2050IFA$="Y"ORA$="y"THENPR
OCsave
 2060PRINT"Goodbye. Thank y
ou for playing."
 2070 END
```

This listing is included in this month's cassette tape offer. See order form on Page 61.

A last round of calls–with inte

JOHN WOOLLARD concludes his series on *FX calls

IN this, the final article in the FX series, I'm going to describe some important calls that haven't been dealt with previously.

We'll also be taking a look at interrupts and how they can aid our programming. First let us consider the following set of calls:

***FX131**
***FX137**
***FX139**
***FX140**
***FX141**

Before trying them out take a look at Program I. The procedure in it allows us to make an OSBYTE call by entering PROCfx(A,X,Y) where A, X and Y are the numbers following the *FX command.

In addition it allows us to see the result of making that call; we can use it to read values.

```
  10 REM Program I
  20 REM
  30 REM
  40 *KEY1PRINT""PROCfx(
, , ) "'::INPUT""aX,xX,yX:P
RDCfx(aX,xX,yX):PRINT""aX x
X yX "aX;xX;yX'M
  50 END
  60 DEFPROCfx(aaX,xxX,yyX
)
  70 AX=aaX
  80 XX=xxX
  90 YX=yyX
 100 oX=USR(&FFF4)
 110 aX=oX AND &FF
 120 xX=(oX AND &FF00)DIV&10
0
 130 yX=(oX AND &FF0000)DIV&
10000
 140 rX=(oX AND &FF000000)DI
V&1000000
 150 ENDPROC
```

Program I

Line 40 sets up a function key so that using the procedure is made easier. When f1 is pressed the prompt:

```
PROCfx( , , )
```

appears. Simply entering the three values of A, X and Y separated by commas causes the procedure to be called and the results displayed on the screen.

An explanation of the workings of the procedure can be found in Part 3 of the FX series in the October 1985 edition of *Electron User*.

Let's take a look at those calls now. Table 1 lists them with their equivalent statement in Basic.

Let's start with *FX137. It's possible to switch the cassette motor on by entering *MOTOR1. Alternatively *FX137,1 or PROCfx(137,1,0) can be used.

You might ask what is the advantage in using OSBYTE over the usual call? In Basic programs there's none, but in machine code programming the advantage is clear.

This call and the others in this group can, by using OSBYTE, be carried out easily.

Program II contains a very short assembly language routine for making a single OSBYTE call.

The operations on lines 80 and 130 ensure that the program can be called at any time without loss of data. That's most important, especially when we come to the use of interrupts later.

You can test Program II by switching on your cassette player.

The values of A, X and Y that are to be used by the OSBYTE call are first stored in the safe locations of &70, &71 and &72 respectively. Enter the following:

```
?&70=137:?&71=1:?&72=0:CALL
&FFF4
```

To switch the cassette off again the following is used:

```
?&70=137:?&71=0:?&72=0:CALL
&FFF4
```

Now to the next call. *FX141 is the same as *ROM and selects the ROM filing system. This is only of interest to users with a Plus 1 or some other hardware enabling ROMs to be plugged in.

By using *FX141 followed by *CAT a catalogue of any ROM software is given.

While the ROM filing system is selected it is not possible to spool files (that gives "Bad command") but *EXEC, *CAT, LOAD and CHAIN work as usual. Even without a Plus 1 present, *ROM or *FX141 do not give errors.

You can use *TAPE or *FX140 to select the tape filing system. You can see if it's been selected correctly by checking for a normal response to *CAT, *SPOOL, LOAD or CHAIN.

*FX131 can be used to find the value of PAGE. That's the address at which Basic programs are stored.

The value of PAGE is calculated by multiplying the result of the call in the Y register by 256. Enter:

```
PROCfx(131,0,0)
```

and then:

```
PRINT~yX*256
```

You should get E00 unless you have a Plus 3 fitted, in which case the result is 1D00.

The value does not truly reflect PAGE, but shows the operating system high water mark (OSHWM). That value moves from &E00 if hardware that requires memory, such as the Plus 3 advanced disc filing system, is fitted.

Another occasion that causes it to move is when memory is set aside for defining extra characters. This is carried out by calling OSBYTE with A equal to 20. The X value determines how much memory is set aside.

Try entering *FX20,6 and then looking to the value of the OSHWM. On an unexpanded Electron it moves to &1400. *FX20,6 allows the maximum number of characters to be redefined.

Let's now turn to *FX139. This is equivalent to *OPT. It's used to change the way in which the computer responds when loading programs from tape and disc.

By changing the two values set by *OPT1 and *OPT2 the performance of the computer can be made to meet the

***FX131**	PAGE
***FX137**	*MOTOR
***FX139**	*OPT
***FX140**	*TAPE
***FX141**	*ROM

*Table I. *FX calls and their Basic equivalent*

```
  10 REM Program II
  20 REM
  30 REM
  40 FOROpt%=0TO2STEP2
  50 P%=&900
  60 [OPTopt%
  70 .start%
  80 PHP:PHA:TXA:PHA:TYA:P
HA
  90 .osbyte%
 100 LDA&70:LDX&71:LDY&72
 110 JSR&FFF4
 120 .rts%
 130 PLA:TAY:PLA:TAX:PLA:P
LP
 140 RTS
 150 ]
 160 NEXT
```

Program II

*FX OS CALLS

Part Six

rruptions

needs of the user.

In all of the following cases the use of *OPT is exactly the same as *FX139, followed by the two values. Table II lists the calls and their effect upon the loading process.

The computer can be put to its default condition by using *OPT without additional values. This is the same as setting *OPT1,1 and *OPT2,1. After an instruction to load a program has been entered the computer prints:

```
Searching
```

When it finds the correct program it displays:

```
Loading
```

and the name of the program. Upon meeting a load error the computer responds with the message:

```
Data?
Rewind tape
Searching
```

If *OPT1,0 is used no messages appear. When the program has correctly loaded the prompt appears, but with no other indication that a new program is present.

If a load error is encountered the message to rewind the tape is given. That is controlled by the *OPT2 call.

*OPT1,2 gives further information about the program that has been loaded. It's particularly useful when loading machine code files.

The information states how long the program is and the load and execution addresses specified when it was saved.

Under this condition spooled files are named when they are EXEcuted. However their length is not given.

*OPT1,2 does not give extra information about the cause of any load error that may occur.

*OPT2,0 and *OPT2,2 cause loading to abort if an error occurs, and usually this in turn causes a "Bad program" error. The prompt to Rewind the tape does not appear.

*OPT2,1 is the default state, and is the most user-friendly.

When an error is met the loading sequence does not abort. The message to rewind the tape is given but may be ignored if a second copy of the file is on the tape.

The computer will start loading the second copy from the point where the error occurred on the first copy. For this reason it is always wise to make multiple copies of any program when recording on tape.

A further use of the OPT call is made by disc filing systems. *OPT4 sets up a disc's response to auto-booting.

If Shift+Break are pressed together the Electron searches for a file called !BOOT on disc. Given the opportunity, it will either *LOAD, *RUN or *EXEC the file if found.

The values used are:

***OPT4,0**	**Do nothing**
***OPT4,1**	***LOAD !BOOT**
***OPT4,2**	***RUN !BOOT**
***OPT4,3**	***EXEC !BOOT**

I use the facility to CHAIN a menu. The required program can then be loaded by pressing a single key.

The facility is used by commercial programs to enable auto loading. If !BOOT is not found the Electron will freeze and you'll have to press Ctrl+Break to reset the computer.

If *OPT4,0 is entered the computer starts up as normal.

All of the FX calls discussed so far have an equivalent command in Basic. The main reason for knowing of them is to enable the activity to be carried out from within a machine code program.

I am now in the habit of using FX calls whenever I can so that the future conversion of any of my Basic programs to assembly language can be made less difficulty.

Program II shows how easily an FX call can be made from assembly language, so do not be afraid to try machine code subroutines out in your own programs.

We can now turn our attention towards the last two calls of this series, *FX13 and *FX14. Before we take a look at what they do I'd better introduce you to interrupts.

One book I have states that an interrupt is a peripheral initiated subroutine, whereas another says it's a hardware signal to the microprocessor indicating that something requires immediate attention.

Here's my definition: An interrupt is what happens when any part of the computer, or bits added on to the back, stops the computer doing the job in hand and makes it do something else.

The computer carries out its tasks normally until an interrupt occurs, then it processes the interrupt routine before returning to the original program.

A nice analogy is to think of me sitting writing this article. I'm busy working away when the telephone rings, that's an interrupt.

I must answer the telephone and then get back to my work afterwards.

Unlike my telephone calls, it's unwise for a computer interrupt to last for more than a few milliseconds, as this may prevent the Electron's processor acting correctly.

There are all sorts of interrupts going on all the time inside the computer, but we're concerned with the ones we can control and therefore use to improve our programming skills.

Fortunately it's easy to get at some of the interrupts by using simple FX calls.

Table III outlines some of the reasons – termed dynamic conditions or events – that can be used to initiate an interrupt.

We can use any of these to make the computer stop working on the program in memory and to do something else before returning to the original program.

Here's a brief example of one application using *FX14,0. With this we can make an interrupt occur each time a particular buffer becomes empty.

Perhaps you've developed a graphics display and wish to add sound to it. It may be extremely difficult to synchronise the commands to produce the sounds with the commands to display the graphics.

When the computer is carrying out the graphics instruction it may hold up the sound output, or the sound output may hold up the graphics.

The solution is to have a

→

***OPT1,0**	***FX139,1,0**	No error messages are given.
***OPT1,1**	***FX139,1,1**	Short error messages are given.
***OPT1,2**	***FX139,1,2**	Load and execution addresses are given.
***OPT2,0**	***FX139,2,0**	Computer ignores all errors and does not prompt you to rewind the tape.
***OPT2.1**	***FX139,2,1**	Computer asks you to try again by rewinding the tape.
***OPT2,2**	***FX139,2,2**	Computer aborts the operation.

*Table II: *FX139*

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From Page 29

machine code program that plays the next note of the tune. By using interrupts that program can be called every time the sound buffer becomes empty. Now you can have your graphics program running quite smoothly and, without you being able to see it, the computer enters a new note into the sound buffer as soon as the last note is made.

Here's a plan of action we should follow in writing our own interrupt routines:

- A machine code routine that carries out the required activity must be written.
- The routine must be placed in a safe location in the computer memory.
- The address of the subroutine's location must be placed in &220 (lo byte) and &221 (hi byte).
- When required the interrupt should be enabled using osbyte call with A=14.
- When the interrupt is no longer needed it should be disabled using OSBYTE call with A=13.

A golden rule with all interrupt routines is that they must not change any variable or condition used by the interrupted program – unless you specifically want them to, of course.

Program III illustrates how the vertical sync can be used to produce a regular, once a second ticking sound.

I have placed the machine code program at &900. Its location can be moved by changing the value of *P%* in line 50.

Once this program has been entered and run the ticking will continue even if another program is loaded. The interrupt has been set up and will continue until it's disabled. That can be achieved by entering *FX13,4.

Program IV illustrates another use of interrupts. This time the routine contains only six bytes of code. It simply produces a beep when it is called.

Lines 40 to 110 set up the six bytes in zero page locations &70 to &75.

Under normal circumstances the beep would be the same as that produced by the Copy key, Ctrl+G or VDU7. However the *FX calls on lines 140/150 change the characteristics of the noise.

Line 160 enables the character entering a buffer event.

This interrupt would be useful in educational programs where it is important that the user knows that a key is being pressed. I've a typing tutor program that has a similar effect built in.

There are some developments of these programs that I'm sure you'd like to try.

For example, how about devising a routine that automatically records the program in memory every five minutes?

This would take away one of the headaches of program development. The technique of using the vertical sync in Program III would have to be used to time the activity.

Well, that's all for this series on *FX commands. I hope you have enjoyed reading it as much as I've enjoyed writing it.

```
10 REM Program III
20 REM
30 REM
40 FORopt%=0TO2STEP2
50 P%=&0900
60 [OPTopt%
70 .start%
80 LDA#interrupt%MOD256:
STA&220
90 LDA#interrupt%DIV256:
STA&221
100 LDA#50:STA&71:STA&70
110 LDA#14:LDX#4:LDY#0:JS
R&FFF4
120 RTS
130 .interrupt%
140 DEC&70:BNErts%
150 LDA&71:STA&70
160 LDA#7
170 LDX#sound%MOD256
180 LDY#sound%DIV256
190 JSR&FFF1
200 .rts%RTS
210 .sound%
220 EQUW1:EQUW-15:EQUW25#
:EQUW1
230 ]
240 NEXT
250 CALLstart%
```

Program III

And this is how it works...

Lines 40 to 240 assemble the machine code program to location &900 onward. The code is divided into three separate sections – lines 70 to 120 set up the interrupt, lines 130 to 200 produce the actual interrupt routine and line 220 contains the sound data.

The routine is set up by placing the address of the interrupt in locations &220 and &221. Lines 80-90 do this.

The start of vertical sync event interrupt is enabled with an OSBYTE call with A=14, X=4 and Y=0 (line 110). Line 100 stores the value 50 in location &71.

That value determines the frequency of the tick. It is set at one tick every 50 vertical sync events – once a second.

Setting the value at &71 to 25 would make the tick occur every half second. The value is also placed in &70.

The interrupt routine itself starts at line 130. The first action is to decrement the value at &70. If the value is still positive the control returns to the main program.

The interrupt routine will only be carried out when the value stored in &70 is reduced to zero. Line 150 immediately puts it back to the original value before sending a tick to the second buffer.

Sound is produced in machine code programs by use of an OSWORD call. The accumulator is set to 7 and the X and Y registers contain the address of an 8 byte block of memory that contains the four sound parameters.

They have been assembled by lines 210 and 220. Line 190 contains the OSWORD call.

Disable call	Enable call	Event
*FX13,0	*FX14,0	Output buffer empty.
*FX13,1	*FX14,1	Input buffer full.
*FX13,2	*FX14,2	Character entering buffer.
*FX13,3	*FX14,3	ADC conversion complete (Acorn Plus 1 only).
*FX13,4	*FX14,4	Start of vertical screen sync.
*FX13,5	*FX14,5	Interval timer = 0.
*FX13,6	*FX14,6	Escape pressed.
*FX13,7	*FX14,7	RS423 RX error – not applicable to the unexpanded Electron.
*FX13,8	*FX14,8	Network error – not applicable to the unexpanded Electron.
*FX13,9	*FX14,9	User event.

Table III: FX13/FX14 and the interrupt initiating events

```
10 REM Program IV
20 REM
30 REM
40 FORopt%=0TO3STEP3
50 P%=&70
60 [OPTopt%
70 LDA#7
80 JSR&FFEE
90 RTS
100 ]
110 NEXT
120 ?&220=&70
130 ?&221=&00
140 *FX214,1
150 *FX213,240
160 *FX14,2
```

Program IV

Software Surgery

THE COLUMN THAT TAKES A LOOK INSIDE THE LATEST RELEASES

Battlefields
BBC Soft

Battling towards a real wargame

IN Battlefields, a two-in-one deal of two player games, BBC Soft is offering a game of strategy, the American Civil War, and a game of tactics, Waterloo.

In case you're puzzled as to the difference between strategy and tactics, strategy is the manipulation of armies, people, politicians and resources to make history go the way you want.

Tactics are how you manoeuvre elements of armies to achieve victory in battles.

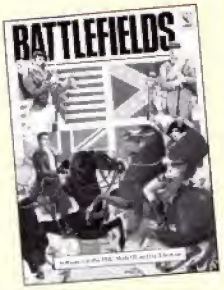
Put more simply, strategy is how you win wars, tactics are how you win battles.

American Civil War presents you with a map of the south and east states of America which were involved in the conflict.

The object is to capture a proportion of your opponent's territory and wipe out his forces.

Each side starts at pre-set locations with three fleets and seven armies, details of which are given for both players at the start.

Each turn is equivalent to one year of the war, divided into eight movement phases representing about one month's campaigning.



Players input all eight moves for each turn in secret and the computer then does the rest.

You quickly become used to the movement system but planning your moves to cope with what your opponent may do is definitely more challenging.

This is an excellent little strategy game and a good introduction to this type of computer wargaming.

The second part of the package, Waterloo, is a representation of the famous last battle of Napoleon which brought the First Empire to an end.

It covers the area around Waterloo and may last for the equivalent of several days. Each turn represents an hour of time.

The armies consist of units commanded by a named general, with most units made up of a mixture of artillery, cavalry and infantry.

Initially the Allies are to the north and east and the French to the south. Each side inputs its movement orders, which are carried out by the computer.

First though – and this is the most interesting part – it reports whether any of your units have sighted or contacted the enemy.

Based on this you plan your next move, but you have to remember that the reports relate to where the enemy was, not where they are now.

When you do clash with the enemy the computer will decide whether it is just a skirmish, and calculates the casualties accordingly.

Alternatively it gives you a close up of the battle area and the battle takes place in 10 minute segments.

I find the last an excellent idea, but wish that more detail

→

Baffled on the way to Hampstead

Hampstead
Melbourne House

THIS is not so much an adventure as a way of life. Superficially, the game seems to be an ordinary text adventure that requires you to get to Hampstead Heath to complete the game.

However it is less a case of solving the game and more a case of attaining the solution.

Hampstead Heath is one of the posh parts of London, and since you start the game in a slum your problem is not just finding your way there but becoming the type of person who deserves to be there.

I confess that I didn't get very far and so I'm obviously doomed to remain a total slob forever. Nonetheless I can give you a few tips to get you going.

The first thing you have to do after leaving the house is to sign on at the dole.

You'll obviously need your UB40, but also make sure you have some transport or you're liable to get mugged. Since you start the game naked you will need clothes, unless you want to get arrested for indecent exposure. You'll find the edge of the Heath close by and it pays to sit and admire the scenery.

A nearby maze is easy to map, though if you manage to use what you find then please let me know how you did it.

I used my money to buy another means of transport and thus found my way to another section of the adventure.

Apart from satisfying my appetite – though I must have done a "runner" as I had no money to pay for my meal – I only managed to get my pockets picked in the cinema, so any help from readers would be welcome.

I found it difficult to relate to the game. It took about five minutes before I realised what a UB40 was!

There are some extremely witty things in the program and I didn't get most of them first time either. If you manage to solve the game you can send off to Melbourne House for a diploma in social climbing, though I hope you'll also send me the solution.

Overall, I was left feeling somewhat baffled by this game, though I hasten to add that the problem is obviously mine and not the program's. I would suggest, however, that you try before you buy.

Merlin

From Page 33

could have been incorporated.

As with American Civil War, you quickly get used to the movement system, but finding and dealing with the enemy is another problem.

Both games have good, clear graphics bearing in mind the scale they are working at, and will keep players busy for a few hours.

I do not believe that there is yet a true wargame available for the Electron of a standard acceptable to serious wargamers, but Battlefields is certainly leading the way.

Roberta Wood

Laser shoot out

Laser Reflex
Talent Computer Systems

AS the commander of a deep space fuel dump, you are a vital part of Earth's exploration project. You are also an excellent target for any passing alien who wants a cheap tank of four star.

Your constant struggle with these thieving aliens forms the theme of Laser Reflex.

The fuel dumps' defences take the form of a mobile laser base situated beneath a plasti-steel roof.

Through this roof you can observe the descending aliens. But if you tried to shoot at them directly you would make a nasty mess of the roof.

The fuel dump designers solved this problem by leaving one end of the dump open. They they built a large curved mirror at this point.

By moving your laser base left and right you can alter the angle at which your beam strikes the mirror. By altering this angle of incidence you also alter the angle of reflection – sounds just like school, doesn't it?

So as you move your base closer to the mirror the beam fires higher into the atmosphere, and vice versa.

The aliens fall from the sky in no set formation and are therefore quite difficult to hit.

To encourage you to move the laser base around, the instructions tell you that bonus points are awarded for hitting the aliens while they are at the top of the screen.

It is tempting to sit at the far left of the screen firing laser bolts at a very shallow angle and stand a chance of hitting more aliens.

Basically, this is an attempt to squeeze a little more life out of the Invaders/Galaxian theme. It is a nice idea, but it will never be a classic.

Jon Revis

Nice one for novice adventurer

Pirate Adventure
Adventure International

IN this, the second in the Scott Adams series of adventures, your task is to collect and store treasures, though there are only two in this game.

You begin your quest in an apartment in London and an immediate search of the premises should be your first task.

Strangely, there seems to be only one room though the stairs do lead to an alcove. The bookcase has only one book – well worth a read and then a second look.

The duffel bag is soon found and a window is very interesting. Don't try any magic yet unless you've realised that the ledge is very slippery.

Several things will be confusing you, but if you remember the sea shanty you may realise that the pirate runs true to form.

That rug will have to be left until later and provides a key to the solution of a later problem.

By now you should be fully equipped to visit the desert island, and so you go off to the main body of the adventure.

This is a beginners' adventure and classed thus by Scott Adams himself.

Although it has only about 20 locations it has its full share of problems. This was one of the first adventures available for a home computer, and still manages to compare favourably with later ones.

An ideal adventure for the novice and one worth having on anyone's shelf. Recommended.

Merlin

Maths with the master touch

Maths with a Story:2
BBC Soft

MANY alleged educational programs are not worth a glance and for good reason: it's doubtful if good educational software can be written without recourse to experienced teachers who can validate and help with development.

Maths with a Story: 2 is an example of the quality which can be achieved by an experienced writer supported by good field work.

This package develops spatial awareness through coordinate geometry and pattern recognition combined in four captivating games.

The first game, Pirate Gold, is a treasure hunt. An island is superimposed on a grid where hidden gold can be found by moving a cursor using X/Y coordinates.

A multicoloured barometer and a changing bleep tone shows how "warm" the hunter is. Further help is given by the coloured squares appearing over coordinates already visited.

The object is to be the first to fill a chest with gold, and the shorter the route taken the greater the amount of gold there is to be found.

Turnflex exploits the concepts of reflection and symmetry by presenting the player with two picture tiles, the second being a reflection of the first.

At the first level the picture is composed of numerals, but higher levels allow the user to design the pictures.

The game starts by the removal of the reflected picture, and the player has to show an understanding of mirrors and reflections to win it back.

Dice Squares is a game of chance and strategy for one or two players, where rows, or squares, are positioned to fill a grid. The size of the rows and squares you can fill is determined by a simulated dice throw.

The last game, Tile Stretch, introduces the concept of stretching and enlargement using tiles to fill a grid in order to capture as large an area as possible.

In each game there is option of turning the sound off, a choice one or two players and a range of difficulties.

Simple screen prompts, along with optional demonstration runs, make the comprehensive booklet supplied with the tape superfluous, and good protection from mischievous fingers enables the programs to be used by pupils without supervision. Highly recommended.

John Daddy

If physics is your subject...

Physics
Letts Keyfacts
Revision Software

EACH year a crop of 16-year-old students get into a panic over O-level or CSE exams. The aim of this package is to assist pupils taking any exam in physics at age 16+.

Its content has taken into account the new GCSE courses as well as the more traditional ones.

I was sent this package to review because I am a teacher of physics. The obvious course of action was to try it out on my present fifth year students.

I was very pleased that the programs run on both the BBC Micro and Electron. Virtually every school, of course, has the faithful BBC Micro.

With two whole tapes full of programs on both sides, my

Joinery without the shavings

WORKSHOP, from Acornsoft, as you might expect, provides the user with a workshop environment in which to build things.

The main fun comes from being able to take objects or shapes such as triangles, squares and circles, then chop bits off them, drill holes and glue them to each other.

Educationally, the idea is that users set their own aims, develop their own plans and experiment as they explore alternative methods of working.

Experiments are encouraged as their effects can be immediately reversed by pressing the Delete key thus ensuring that no damage is done.

There are four main pages or operating areas: Shelf, Plan, Machines and Look.

At the start you are presented with the Shelf page from which you can select an object to work on – either a circle, square or triangle.

Once you've made your selection you move on to Plan by pressing Escape.

Here your object is shown in a large box in the centre of the screen. Surrounding the box is a set of icons representing the various machines you can use.

You can position your object around inside the box by using the cursor keys and then select a machine from the following:

***Drill** bores a hole at the centre of the main box, the position of the object being drilled having been selected by the cursor keys. The size of the drilled hole increases with each press of the Return key.

***Paint** paints your object in any of seven colours.

***Not** acts like a mould which surrounds the chosen shape. The mould then becomes the new shape.

***Scale** allows you to enlarge or reduce your object.

***Cut** has a blade which can be moved left and right. When Return is pressed the blade cuts down through your object.

***Squash** squashes or stretches your object.

***Glue** will glue your present object to one you have previously made and stored.

***Rotate** turns your object through 90 degrees so that you can work on all sides.

These machines are very versatile and the graphical effects quite clever.

One very good feature is the Look option. As you build your object each key press you make is stored.

On selecting Look every process you have taken your object through is impressively replayed in graphic detail.

This is a very useful feature for the teacher or parent who does not have time to work through the program with the user but wishes to review the work later.

The environment provided by Acornsoft's Workshop is definitely conducive to logical thinking and closely simulates that of a real workshop.

Robin Nixon

pupils could not cover much of it in school time. We concentrated on the first program, called the diagnostic test.

This consists of 40 multiple choice questions covering the full spectrum of physics work. It certainly seemed appropriate to the O level syllabus which I teach.

If a pupil gets a question wrong, a hint is given. If the question still can't be solved, the answer is given.

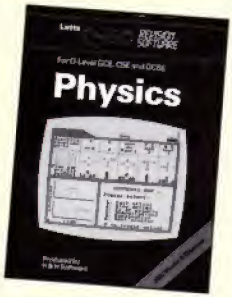
At the end of the test the pupil's performance is analysed. Areas of weakness are highlighted and a revision program is suggested.

The verdict of my students was that this program was rather dull and needed a degree of dedication to work through. The analysis of their performance, however, was rated useful.

The next program on the first tape deals with relationships. If you think that sounds physical rather than physics, it really means equations.

In this section a number of graphs are drawn to show how one thing depends on another, such as volume and temperature.

You then have to pick the correct relationship from a choice of four (volume is



proportional to temperature).

A student who was really involved in revision would find this section useful but rather limited in approach.

The motion programs on side two of the first tape are very hard to understand, in fact I don't understand them myself.

They are meant to cover speed, velocity, acceleration, force, energy, work, power and momentum. I can only recommend O level or CSE students to leave them well alone.

The program on ray optics is a good, tidy revision program. There is nothing startling about it though. It presents some information on reflection, refraction and eye defects.

The problems which follow are neatly constructed, and even suggest that you should draw out ray diagrams on paper.

Turning to the second tape we come to the best program of the lot, on radio-activity. This topic is usually covered poorly in schools and little real practical work can be done.

It simulates an experiment to detect the various forms of radiation.

You have a source of unknown radiation and a geiger counter.

These can be moved around the screen along with various blocking materials (paper, aluminium and lead) and a magnet.

By reading the counter, with or without sound, it is possible to work out whether the source is emitting alpha, beta or gamma radiation.

As an enhancement, you can use the information gained to work out decay products.

This particular program makes the user adopt investigative methods and is suitable for use in schools as well as by revising pupils.

A multiple choice test on waves follows.

The help and hints are well put together and our revising pupil may well find them useful. The same could also be said of the two programs on electricity and magnetism.

One is a multiple choice test, the other a lesson comparing the flow of electricity with that of water.

The last program is about heat. It is poor and the screen display is muddled – quite the weakest program in the package.

One criticism I have of the entire package is that the programs drive the operator. It would all be better if users could have some peace while thinking.

The system of entering responses is distinctly poor. My pupils complained that they got answers wrong because the cursor moved on to the next possible response as they pressed Return.

There's a lot of program here to summarise. The first point is that you get your money's worth as far as quantity is concerned.

It's a pity that a couple of the programs are very poor, but the package as a whole is worthwhile for 16-year-old physics students.

Certainly a number of mine are going to buy it now they've seen it.

Roger Frost

Never before have there been such money-saving offers for readers of a computer magazine!

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How the Plus 1 helps you m the most of your Electron

With the Plus 1, you and your Electron enter a whole new computing dimension. The Plus 1 turns your Electron into a fully fledged micro capable of using printers, joysticks and cartridge ROMs – the software that comes on a chip. In addition, the Plus 1's analogue to digital port gives access to the outside world – while the slots for the ROM cartridges allow the Electron to take advantage of the latest, most exciting hardware developments yet to be released.

If you want to use your Electron to the full, then it's essential you get a Plus 1.

Normal p

Speci for re Electr

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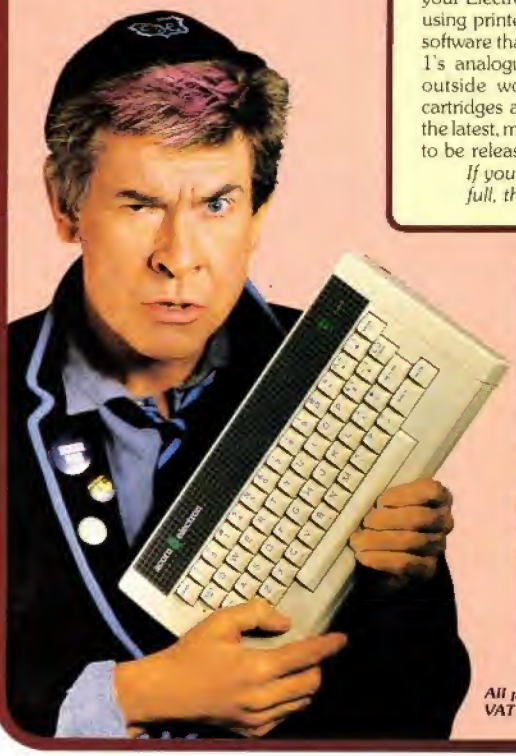

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EXPAND – with the Electron Language Lab

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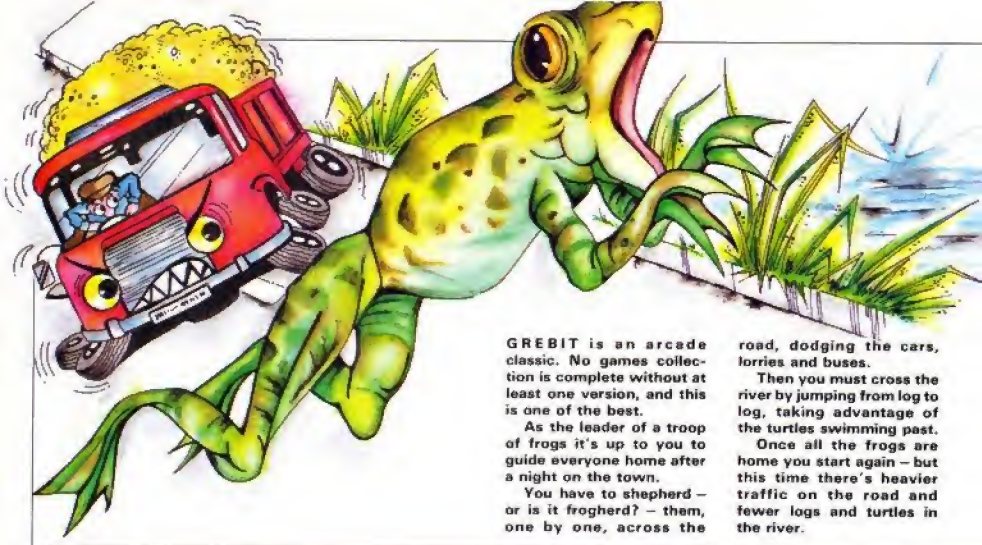

GREBIT is an arcade classic. No games collection is complete without at least one version, and this is one of the best.

As the leader of a troop of frogs it's up to you to guide everyone home after a night on the town.

You have to shepherd – or is it frogherd? – them, one by one, across the road, dodging the cars, lorries and buses.

Then you must cross the river by jumping from log to log, taking advantage of the turtles swimming past.

Once all the frogs are home you start again – but this time there's heavier traffic on the road and fewer logs and turtles in the river.

Grebit listing

```
   10 REM Grebit
   20 REM By S.Merrigan
   30 REM (c) Electron User
   40 DATA 0,127,0,255,139,
138,103,51,48,248,112,255,1
5,10,15,255,240,240,240,255
,15,10,15,255,128,192,192,2
38,31,27,63,204
   50 DATA 51,34,34,255,255
,252,252,48,205,69,69,237,2
37,205,205,0,0,0,16,56,15,1
5,15,0,112,192,128,0,15,195
,195,192
   60 DATA 255,255,255,255,
252,203,195,3,255,255,255,2
55,255,247,240,0,238,238,23
8,238,239,238,240,0,204,204
,255,255,249,150,150,6
   70 DATA 15,127,93,93,127
,124,60,48,15,255,85,85,255
,255,15,0,15,255,85,85,255,
254,30,16,14,239,69,69,205,
197,135,128
   80 DATA 48,67,67,67,255,
138,138,119,224,48,24,24,25
5,10,10,255,0,0,0,0,239,42,
76,136,0,4,8,8,8,8,8,4
   90 ON ERROR GOTO 4670
  100MODE4:VDU23,1,0;0;0;0;
:PROCins:PROChi_cl:*FX16
  110@%=DE5:VDU23,1,0;0;0;0;:P
RINT''"Hang about..."
  120 PROCinit
  130 PROCassemble
  140 PROCzhole
  150 REPEAT:growX=0:?score
=0:score?!=0:LIX=9:?speed=5
  160 ?&8D=&90:?&8E=&78
  170 growX=growX+1:IF grow
X>3 growX=3
  180 ?&96=0:CLS:PROCdraw
  190 ?if=0:?ifs=0
  200 FOR1=0TO5:frogX(I)=0:
NEXT
  210 bonus?1=5:FROGX=0:?bo
nus=0
  220 REPEAT:*FX15,0
  230 ?&8D=16:?&8E=121:CALL
erase
  240 ?xco=16:?yco=2:?dead=
0
  250 ?&96=5:CALLgame
  260 IF ?dead=1 OR frogX(?
&70)=1 OR ?dead=4 PROCw
  270 IF ?dead=2 AND frogX(
?&70)=0 PROCfrog
  280 IF ?dead=3 bonus?!=5:
?dead=1:GOTO260
  290 UNTIL LIX=0 OR FROGX=
5
  300 IF FROGX=5 PROCcl:GOT
O 170
  310 PROCcoped_it
  320 SCX=1000*((?score AND
&F0)DIV&10)+100*(?score AND
&F)+10*((score?1 AND&F0) DI
V&10)+(score?1 AND&F)
  330 CLS:IF SCX>HIX(5)PROC
hi
  340 PROChi_sc
  350 PROChi_cl
  360 UNTIL FALSE
  370 DEF PROCw:VDU7
  380 LIX=LIX-1:PROCa(17,30
STR$(LIX))
  390 IF ?dead=4 GOTO420
  400 A=?yco:IF A=16 OR A=2
0 OR A=24 CALLwhat:CALLplus
:CALLwhat2:GOTO430
  410 IF A=18 OR A=22 CALLw
hat2:CALLminus:CALLwhat:GOT
O430
  420 CALLerase
  430 CALLcreak:FOR1=100TO5
0STEP-1:SOUND1,-15,I,1:NEXT
:CALLcreak
  440 ENDPROC
  450 DEF PROCassemble
  460 DIMGX 2000
  470 FOR1=0TO2STEP2
  480 P%=GX
  490 [OPT1
  500 .hole EQUB0:EQUB0:EQU
B0:EQUB0:EQUB0:EQUB0:EQUB0:
EQUB0
  510 .bonus EQUW0
  520 .score EQUW0
  530 .skel EQUW&8783:EQUW&
8727:EQUW&1303:EQUW&8143:EQ
UW&0E1C:EQUW&0E4E:EQUW&8C8C
:EQUW&182C
  540 .ti EQUB0:EQUB0
  550 .speed EQUB0
  560 .gan JSRban
  570 .game
  580 JSRtime
  590 JSRset
  600 JSRrset
  610 JSRshove
  620 JSRman
  630 LDAdead:CMP#0:BEQgame
1:JMPdeath
  640 .game1 DECcounter
  650 BPLgame
  660 LDA#5
  670 STAcounter
  680 JMPgam
  690 .death RTS
  700 .set
  710 LDX#24
  720 LDA#32:STA&70
  730 LDA#&5D:STA&71
  740 LDA#40:STA&72
  750 LDA#&5D:STA&73
  760 LDA#&1B:STA&74
  770 LDA#&5E:STA&75
  780 .begin
  790 LDYcounter
  800 CPX#24:BNEce:JMPre
  810 .ce CPX#8:BNEche:JMPr
e
  820 .che CPX#20:BNEchel:L
DAstevie,Y:CMP#1:BEQre:JMPa
dd
  830 .chel CPX#16:BNEche2:
LDAstevie+12,Y:CMP#1:BEQre:
```

GREBIT!

Hop to it and guide your frog troop home in this arcade classic by STEPHEN MERRIGAN

PROCEDURES

init	Sets the variables and envelopes. Defines the characters and dims the arrays.
assemble	Assembles the machine code.
draw	Draws the screen.
coped_it	Called when you've lost all your lives.
hi	Puts your name in the high score table.
hi_score	Prints the high score table.

VARIABLES

FROG%	Number of frogs home.
LI%	Number of lives.
SC%	Score.
HI%(5)	High scores.

```
JMPadd
  840 .che2 CPX#12:BNEche3:
LDAstevie+6,Y:CMP#1:BEQre:J
MPadd
  850 .che3 CPX#4:BNEre:LDA
stevie,Y:CMP#1:BEQre:JMPadd
  860 .re LDY#7
  870 .loop
  880 LDA(&70),Y
  890 STA&76,Y
  900 DEY
  910 BPLloop
  920 LDY#8
  930 .shift
  940 LDA(&72),Y
  950 STA(&78),Y
  960 INY
  970 BNEshift
  980 LDY#7
  990 .replace
 1000 LDA&76,Y
 1010 STA(&74),Y
 1020 DEY
 1030 BPLreplace
 1040 .add
 1050 LDA&71:CLC:ADC#&5:STA
&71
 1060 LDA&73:CLC:ADC#&5:STA
&73
 1070 LDA&75:CLC:ADC#&5:STA
&75
 1080 DEX:DEX:DEX:DEX
 1090 LDAif:CMP#1:BNEone:JS
Rerase:LDA#0:STAif
 1100 .one CPYyco:BNEtwo:CP
X#16:BPLtwo:JSRlo ri:LDA#1:
STAif:JSRerase
 1110 .two CPX#0:BEQend:JMP
begin
 1120 .end RTS
 1130 .rset
 1140 \right
 1150 LDX#18
 1160 LDA#&98:STA&7D
 1170 LDA#&60:STA&7E
 1180 LDA#&98:STA&7F
 1190 LDA#&5F:STA&80
 1200 LDA#&A0:STA&81
 1210 LDA#&5F:STA&82
 1220 .rbegin LDYcounter
 1230 CPX#14:BNErce:JMPrre
 1240 .rce CPX#10:BNErche:J
MPrre
 1250 .rche CPX#18:BNErche1
:LDAstevie+6,Y:CMP#1:BEQrch
e1:JMPradd
 1260 .rche1 CPX#6:BNErre:L
DAstevie+6,Y:CMP#1:BEQrre:J
MPradd
 1270 .rre LDY#7
 1280 .rloop
 1290 LDA(&7D),Y
 1300 STA&85,Y
 1310 DEY
 1320 BPLrloop
 1330 LDY#255
 1340 .rshift
 1350 LDA(&7F),Y
 1360 STA(&81),Y
 1370 DEY
 1380 BNErshift
 1390 LDY#7
 1400 .rreplace
 1410 LDA&85,Y
 1420 STA(&81),Y
 1430 DEY
 1440 BPLrreplace
 1450 .radd CPX#14:BNEradd2
:LDA#&A:STA&7D:JMPradd3
 1460 .radd2 LDA#&05:STA&7D
 1470 .radd3 LDA&82:CLC:ADC
&7D:STA&82
 1480 LDA&80:CLC:ADC&7D:STA
&80
 1490 LDA&7E:CLC:ADC&7D:STA
&7E
 1500 DEX:DEX:DEX:DEX
 1510 LDAifs:CMP#1:BNEones:
JSRerase:LDA#0:STAifs
 1520 .ones CPXyco:BNEtwos:
CPX#14:BPLtwos:CPX#6:BMItwo
s:JSRlo_le:LDA#1:STAifs:JSR
erase
 1530 .twos CPX#2:BEQrend:J
MPrbegin
 1540 .rend RTS
 1550,sound EQUW&11:EQUW1:E
QUW30:EQUW2
 1560.man LDAdead:CMP#0:BEQ
aans:RTS
 1570.aans LDA#129:LDY#0:JS
R&FFF4
 1580CPY#&FF:BNEman1:RTS
 1590.man1 CPX#58:BNEman2:J
MPup
 1600.man2 CPX#47:BNEman3:J
MPdown
 1610.man3 CPX#90:BNEman4:J
MPleft
 1620.man4 CPX#68:BNEman5:J
MPright
 1630.man5 CPY#&1B:BNEman6:
LDA#126:JSR&FFF4
 1640.man6 RTS
 1650.up JSRerase:JSRso:JSR
scoring
 1660INCyco:INCyco:JSRups
 1670LDAxman:SEC:SBC#128:ST
Axman
 1680LDAxman+1:SBC#2:STAxma
n+1
 1690LDA#0:STAfrog:JSRin_fr
o:JMPerase
 1700.down JSRerase:JSRso
 1710DECyco:DECyco:JSRdo
 1720LDAxman:CLC:ADC#128:ST
Axman
 1730LDAxman+1:ADC#2:STAxma
n+1
 1740LDA#48:STAfrog:JSRin_f
ro:JMPerase
 1750.left JSRerase:JSRso
 1760DECxco:DECxco:JSRter
 1770LDAxman:SEC:SBC#16:STA
```

From Page 39

```
xman
 1780LDAxman+1:SBC#0:STAxma
n+1
 1790LDA#32:STAfrog:JSRin_f
ro:JMPerase
 1800.right JSRerase:JSRsc
 1810INCxco:INCxco:JSRter
 1820LDAxman:CLC:ADC#16:STA
xman
 1830LDAxman+1:ADC#0:STAxma
n+1
 1840LDA#16:STAfrog:JSRin_f
ro:JMPerase
 1850.erase
 1860LDY#15
 1870.erase1
 1880LDA(xman),Y
 1890EOR(frog),Y
 1900STA(xman),Y
 1910DEY
 1920BPLerase1
 1930RTS
 1940 .shove LDAxco:CMP#16:
BPLshove1:RTS
 1950 .shove1 LDYcounter
 1960 CMP#16:BNEhe1:LDAstev
ie+12,Y:CMP#1:BNEhe1:JMPsle
ft
 1970 .he1 CMP#18:BEQsright
 1980 CMP#20:BNEhe2:LDAstev
ie,Y:CMP#1:BNEhe2:JMPsleft
 1990 .he2 CMP#22:BNErhe:LD
Astevie+6,Y:CMP#1:BNErhe:JM
Psright
 2000 .rhe CMP#24:BEQsleft
 2010 RTS
 2020 .sleft
 2030 DECxco:JSRter
 2040 LDAxman
 2050 SEC
 2060 SBC#8
 2070 STAxman
 2080 LDAxman+1
 2090 SBC#0
 2100 STAxman+1
 2110 RTS
 2120 .sright
 2130 INCxco:JSRter
 2140 LDAxman
 2150 CLC
 2160 ADC#8
 2170 STAxman
 2180 LDAxman+1
 2190 ADC#0
 2200 STAxman+1
 2210 RTS
 2220 .ter
 2230 LDAxco:CMP#2:BPLter1:
LDA#1:STAdead
 2240 .ter1 CMP#33:BMIter2:
LDA#1:STAdead
 2250 .ter2 RTS
 2260 .do LDAyco:CMP#1:BPLd
or:LDA#1:STAdead
 2270 .dor RTS
 2280 .ups LDAyco:CMP#26:BE
Qupes:RTS
 2290 .upes LDY#co:LDAhole-
2,Y
 2300 CMP#0:BEQape:INY:LDAh
ole-2,Y:CMP#0:BEQape:STA&70
:LDA#2:STAdead:JMPhome
 2310 .ape LDA#1:STAdead:RT
S
 2320.so LDY#sound DIV256:L
DX#sound MOD256:LDA#7:JSR&F
FF1:RTS
 2330 .what
 2340 LDY#15
 2350 .what1
 2360 LDA(xman),Y
 2370 EOR(frog),Y
 2380 STA(xman),Y
 2390 DEY:CPY#7
 2400 BNEwhat1
 2410 RTS
 2420 .what2
 2430 LDY#7
 2440 .what3
 2450 LDA(xman),Y
 2460 EOR(frog),Y
 2470 STA(xman),Y
 2480 DEY:BPLwhat3
 2490 RTS
 2500 .bon
 2510 SED:SEC:LDAbonus:SBC#
1:STAbonus
 2520 LDAbonus+1:SBC#0:STAb
onus+1:CLD
 2530 LDA#31:JSR&FFEE:LDA#9
:JSR&FFEE
 2540 LDA#30:JSR&FFEE
 2550 LDAbonus+1:AND#&0F
 2560 CLC:ADC#48:JSR&FFEE
 2570 LDAbonus:LSR A:LSR A:
LSR A:LSR A
 2580 CLC:ADC#48:JSR&FFEE
 2590 LDAbonus:AND#&0F
 2600 CLC:ADC#48:JSR&FFEE
 2610 LDAbonus+1:CMP#0:BEQb
one:RTS
 2620 .bone LDAbonus:CMP#0:
BEQbone1:RTS
 2630 .bone1 LDA#3:STAdead:
RTS
 2640 .plus INCxman+1:RTS
 2650 .minus DECxman+1:RTS
 2660 .scoring
 2670 SED:CLC:LDAscore+1:AD
C#5:STAscore+1
 2680 LDAscore:ADC#0:STAsco
re:CLD
 2690 LDA#31:JSR&FFEE:LDA#2
:JSR&FFEE
 2700 LDA#30:JSR&FFEE
 2710 LDAscore:LSR A:LSR A:
LSR A:LSR A
 2720 CLC:ADC#48:JSR&FFEE
 2730 LDAscore:AND#&0F
 2740 CLC:ADC#48:JSR&FFEE
 2750 LDAscore+1:LSR A:LSR
A:LSR A:LSR A
 2760 CLC:ADC#48:JSR&FFEE
 2770 LDAscore+1:AND#&0F
 2780 CLC:ADC#48:JMP&FFEE
 2790 .home SED:CLC:LDAscor
e+1:ADC#95:STAscore+1
 2800 LDAscore:ADC#0:STAsco
re:CLD
 2810 JMPscoring
 2820 .creak
 2830 LDY#15
 2840 .creak1
 2850 LDAskel,Y
 2860 EOR(xman),Y
 2870 STA(xman),Y
 2880 DEY
 2890 BPLcreak1
 2900 RTS
 2910 .lo_ri LDY#19
 2920 LDA(xman),Y
 2930 LDA(xman),Y
 2940 CMP#0:BNElo1:RTS
 2950 .lo1 LDA#1:STAdead:RT
S
 2960 .lo_le LDY#0
 2970 LDAxman:SEC:SBC#4:STA
xman
 2980 LDA(xman),Y
 2990 CMP#0:BNElo2:JMPlo3
 3000 .lo2 LDA#1:STAdead
 3010 .lo3 LDAxman:CLC:ADC#
4:STAxman:RTS
 3020 .in_fro
 3030 LDAyco
 3040 CMP#16:BEQin_fro1
 3050 CMP#18:BEQin_fro1
 3060 CMP#20:BEQin_fro1
 3070 CMP#22:BEQin_fro1
 3080 CMP#24:BEQin_fro1
 3090 RTS
 3100 .in_fro1 LDY#4
 3110 LDA(xman),Y
 3120 CMP#0:BEQin_front
 3130 LDY#12
 3140 LDA(xman),Y
 3150 CMP#0:BEQin_front
 3160 RTS
 3170 .in_front LDA#4:STAde
ad:RTS
 3180 .time
 3190 LDX#ti MOD256:LDY#ti
DIV256:LDA#2:JSR&FFF1
 3200 .time1
 3210 LDX#ti MOD256:LDY#ti
DIV256:LDA#1:JSR&FFF1
 3220 LDAti:CMPspeed:BMItim
e1
 3230 LDA#0:STAti:STAti+1:S
TAti+2:STAti+3:STAti+4
 3240 RTS
 3250 ]
 3260 NEXT
 3270 ENDPROC
 3280 DEF PROCdraw
 3290 VDU19,18,23,255,15,15
,15,15,15,15,15,15
 3300 VDU19,1,0,0,0:VDU19,2
,0,0,0:VDU19,3,0,0,0
 3310 COLOUR130:PRINTTAB(2,
14);STRING$(16," ");:COLOUR
131
 3320 PRINTTAB(2,26);STRING
$(16," ");
 3330 FORI=0TO2:PRINTTAB(2,
I);STRING$(16," ");:NEXT
 3340 COLOUR128:COLOUR3
 3350 FORI=1TO2:VDU31,3,I,3
2,255,9,32,255,9,32,255,9,3
2,255,9,32,255:NEXT
 3360 GCOL0,1:MOVE120,160:D
RAW1152,160:DRAW1152,1023:D
RAW120,1023:DRAW120,160
 3370 MOVE120,540:DRAW1152,
540
 3380 MOVE120,576:DRAW1152,
576
 3390 MOVE120,192:DRAW1152,
192
 3400 MOVE1152,928
 3410 FORI=1152TO276STEP-19
2:DRAWI-8,928:DRAWI-96,928:
DRAWI-96,992:DRAWI-200,992:
DRAWI-208,928:NEXT:DRAW120,
928
 3420 PROCde(40,&7690,qrowX
-(RND(2)-1))
 3430 PROCde(60,&7410,qrowX
-(RND(2)-1))
 3440 PROCde(50,&7190,qrowX
-(RND(2)-1))
 3450 PROCde(80,&6F40,qrowX
-(RND(2)-1))
 3460 PROCde(70,&6C90,qrowX
-(RND(2)-1))
 3470 PROCturtle(&6528,RND(
2))
 3480 PROCturtle(&6028,RND(
```

```
21)
 3490 IF grow%=3 GOTO3510
 3500 PROCloq(&6778,3)
 3510 PROCloq(&67D8,2)
 3520 PROCloq(&6248,4)
 3530 PROCloq(&5D90,6)
 3540 PROCa(1,28,"Score  Ti
me   Lives")
 3550 PROCa(17,30,STR$(LIX)
)
 3560 VDU19,1,1,0;0;VDU19,2
,2,0;0;VDU19,3,3,0;0;
 3570 ENDPROC
 3580 DEF PROCzhole:RESTORE
3600:FORI=0TO31:READA:?(hol
e+I)=A:NEXT:ENDPROC
 3590 DEFPROCinit
 3600 DATA0,0,1,1,1,0,0,0,2
,2,2,0,0,0,3,3,3,0,0,0,4,4,
4,0,0,0,5,5,5,0,0,0
 3610 RESTORE3730
 3620 FORI=0TO63:READA:!?&C
00=A:NEXT:*FX11,0
 3630 ENVELOPE1,128,1,2,80,
2,2,8,127,0,0,0,0,0
 3640 xman=&80:frog=&8F:zco
=&92:yco=&93:if=&94:ifs=&95
:stevie=&99:dead=&98:counte
r=&96:?&96=0
 3650 ?frog=0:frog?1=&0C
 3660 RESTORE3720
 3670 DIMAX(5):DIMHI$(7):DI
M HIX(7):FORI=0TO1STEP-1:HI
X(I)=10:HI$(I)="STEVIE":NEX
TI
 3680 DIMfroqX(5)
 3690 FORI=0TO17:READA:stev
ie?I=A:NEXT
 3700 AX(1)=&5970:AX(2)=&59
A0:AX(3)=&5900:AX(4)=&5A00:
AX(5)=&5A30
 3710 ENDPROC
 3720 DATA1,1,1,1,1,0,1,1,1
,0,1,0,1,0,1,0,1,0
 3730 DATA129,165,195,3,1,2
25,128,192,24,92,60,12,8,12
8,16,48
 3740 DATA224,160,32,3,3,32
,160,224,112,64,46,15,15,46
,64,112
 3750 DATA224,32,71,15,15,7
1,32,224,112,80,64,12,12,64
,80,112
 3760 DATA192,128,225,1,3,1
95,163,129,48,16,120,8,12,6
0,77,24
 3770REM LOG
 3780DATA 119,221,136,170,1
70,136,221
 3790DATA119,15,140,143,137
,143,142,139,15
 3800DATA15,14,15,0,15,2,7,
15,15,1
 3810DATA15,8,15,3,14,15
 3820REM END LOG
 3830DATA 15,9,15,12,15,9,1
5,14,14,3
 3840DATA15,5,15,1,15,14
 3850 DEF PROCde(lines%,pos
it%,num%)
 3860 FORI%=1TOnum%:RESTORE
lines%:FORJ%=0TOJ1:READAX:J
%?posit%=AX:NEXT:C%=RND(7):
FORK%=0TO4+C%:CALLset:CALLr
set:NEXT,
 3870 ENDPROC
 3880DATA 192,71,50,116,119
,51,71,192
 3890DATA36,8,132,222,222,1
48,8,36
 3900 DEF PROCturtle(posit%
,num%)
 3910 FORUU=1TOnum%:C%=RND(
5):FORK%=0TO10+C%:CALLrset:
NEXTK%
 3920 FORI%=0TO2:RESTORE388
0:CALLrset:CALLrset:FORJ%=0
TO15:READAX:J%?posit%=AX:NE
XTJ%,I%
 3930 NEXTUU
 3940 ENDPROC
 3950 DEF PROCloq(posit%,le
ngth%)
 3960 RESTORE3780:FORI%=0TO
15:READAX:I%?posit%=AX:NEXT
 3970 FORI%=1TOlength%:REST
ORE3800:CALLset:CALLset
 3980 FORJ%=0TO15:READAX:J%
?posit%=AX:NEXT,
 3990 FORJ%=0TO15:READAX:J%
?posit%=AX:NEXT
 4000 ENDPROC
 4010 DEF PROCfroq:FROG%=FR
OG%+1:SOUND&11,-15,110+FROG
%*10,4:RESTORE4030:froqX(?&
70)=1:FORI%=0TO23:READBX:I%
?AX(?&70)=BX:NEXT:FORI%=320
TO343:READBX:I%?AX(?&70)=BX
:NEXT:ENDPROC
 4020 DEFPROCa(AX,BX,A$):CO
LOUR3:PRINTTAB(AX,BX);A$:VD
U5:BCOL0,2:MOVE4X+64-8,1016
-BX+32:PRINT;A$:VDU4:ENDPRO
C
 4030DATA 17,49,49,48,16,51
,115,115
 4040DATA153,249,96,240,240
,240,255,255
 4050DATA136,200,200,192,12
8,204,236,236
 4060 DATA113,49,48,50,50,1
7,0,51
 4070 DATA255,255,255,255,2
40,153,153,153
 4080 DATA232,200,192,196,1
96,136,0,204
 4090 DEF PROChi
 4100 PROCa(0,5,"YOU ARE IN
THE TOP 5")
 4110 PROCa(0,6,"----------
----------")
 4120 PROCa(5,10,"Enter nam
e")
 4130 PROCa(5,13,"_________
")
 4140 COLOUR1:INPUTTAB(5,12
)S$
 4150 S$=LEFT$(S$,10):HI$(7
)=S$:HIX(7)=SC%
 4160 FORI=5TO1STEP-1
 4170 IF HIX(7))HIX(I) PROC
swap
 4180 NEXT
 4190 CLS
 4200 ENDPROC
 4210 DEF PROCswap
 4220 HIX(I+1)=HIX(I):HI$(I
+1)=HI$(I)
 4230 HIX(I)=HIX(7):HI$(I)=
HI$(7)
 4240 ENDPROC
 4250 DEF PROChi sc
 4260 PRINTTAB(4,2);"Hi Sco
res"
 4270 PROCa(4,3,"-- -------"
)
 4280 FORI=4TO20STEP4
 4290 PROCa(0,4+I,STR$(I/4)
)
 4300 PROCa(2,4+I,HI$(1/4))
 4310 PROCa(14,4+I,STR$(HIX
(I/4)))
 4320 NEXT
 4330 COLOUR1:VDU19,2,4,0;0
;0;0;
 4340 PRINT'''SPC(4);"Press
 Space";
 4350 REPEAT UNTIL GET$=" "
:ENDPROC
 4360 ?speed=?speed-1:IF ?s
peed<0 OR ?speed>5 ?speed=0
:ENDPROC
 4370 DEF PROCcl:PRINTTAB(0
,0);:FORI=0TO31:VDU11:SOUND
1,1,I*2,2:NEXT
 4380 ?speed=?speed-1:IF ?s
peed<0 ?speed=0:ENDPROC ELS
E ENDPROC
 4390 DEF PROCcooed_it
 4400 FORI=1TO11:VDU28,2,13
,17,3,11,28,2,25,17,15,31,0
,10,10
 4410 SOUND1,-15,100+I*10,2
 4420 NEXT
 4430 VDU26
 4440 PROCcl:ENDPROC
 4450 DEF PROChi cl
 4460 GCOL0,0
 4470 FORI%=0TO640STEP16:MO
VEI%,0:DRAWI%,1024:MOVEI%+8
,0:DRAWI%+8,1024:MOVE1279-I
%+8,0:DRAW1279-I%+8,1024:MO
VE1279-I%,0:DRAW1279-I%,102
4:SOUND1,1,I%/4,1:NEXT
 4480 ENDPROC
 4490 DEF PROCins:VDU28,1,3
1,39,0
 4500 VDU19,0,4,0;0;VDU19,1
,3,0;0;DRAW1279,0:DRAW1279,
1023:DRAW0,1023:DRAW0,0
 4510 PRINT TAB(14);"INSTRU
CTIONS"
 4520 PRINTTAB(14);"--------
-----"
 4530PRINT"Guide the frog
s across the road"
 4540 PRINT"avoiding cars,
buses and lorries,then"
 4550 PRINT"hop from logs
to turtles making sure"
 4560 PRINT"not to land in
the river as you cannot"
 4570 PRINT"swim."
 4580 PRINT"  Ten points
 are awarded for every"
 4590 PRINT"forward jump
and 100 for every frog"
 4600 PRINT"home. As the g
ame progresses the road"
 4610 PRINT"becomes more
crowded and the number"
 4620 PRINT"of logs and tu
rtles becomes less."
 4630 PRINT'TAB(12);"Your k
eys are-"
 4640 PRINT'TAB(9);"Z - lef
t  X - right"
 4650 PRINT'TAB(9);": - up
   / - down"
 4660 PRINT'TAB(13);"PRESS
SPACE":REPEAT UNTILGET$=" "
:ENDPROC
 4670 MODE6:VDU7:REPORT:PRI
NT;" at line ";ERL
```

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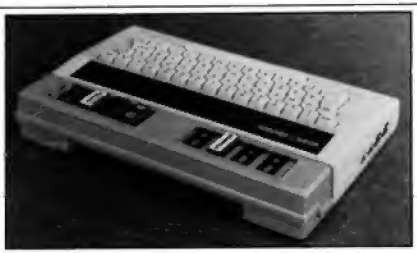

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ASC and ye shall be given the key to programming power

THIS month we're going to take a brief look at some of the functions available in Electron Basic.

Combined with what you've already learnt, these functions will improve your programming power enormously, enabling you to use your Electron to solve real life problems, rather than the somewhat academic exercises we've indulged in so far.

Don't be too concerned if you can't see the point of some of them or if they seem a bit mathematical.

When you need them, you'll understand why Basic has them and be glad. Until then, just keep them in the back of your mind.

Put simply, a function is just a Basic keyword that, usually, takes a number or string and produces a result. The result that is produced depends on what you give the function to work on.

If that seems a little obscure, don't let it worry you. After all, you've already been using functions quite happily when we dealt with string slicing. Table I lists the string handling functions that we've got to know and love.

ASC
CHR$
LEFT$
LEN
MID$
STR$
STRING$

Table I: String handling functions

Take ASC, for example. If you give the function the letter A to work on, you get the result shown by:

```
PRINT ASC("A")
```

However, if you change the string you give the function to work on making it, say, a then:

```
PRINT ASC("a")
```

gives you a different result. You get 65 or 97 depending on what you ask the function to work on.

This string or – in later examples – number, is known as the argument or parameter of the function. So if I used the function LEN to find the number of characters in a string *anystring$*, I would use:

```
LEN(anystring$)
```

The string *anystring$* is the argument or parameter given to the function LEN for it to work its wicked way with.

There's another group of functions that you can use in your programs. These deal with numbers and calculations. Table II lists them all.

The ABS function is used to take away the negative sign, if any, from in front of a number. Try:

```
PRINT ABS(-9)
```

and:

```
x=-2:y=3
PRINT ABS(x*y)
```

and you'll see what that means. You just get the positive number returned from the function.

You'd use ABS in programs where you didn't want a negative sign. Suppose you were keeping track of the amount of money in your bank account with a variable *amount* and you went into the red. You might have a line in the program warning you, such as:

```
IF amount<0 THEN PRINT "You
owe "; amount
```

However being told you owe –5 pounds is a bit silly. A line like:

```
IF amount<0 THEN PRINT "You
owe "; ABS(amount)
```

is what you need.

Where ABS really comes into its own is when it's used to give the range between two numbers.

Suppose that the hottest temperature during the day is 70°C and the coolest 30°C. You should have no trouble in figuring out that the range of temperatures is 40 (70–30). But what if one or both is negative? Here ABS comes to the rescue. Try:

```
PRINT ABS(x-y)
```

with the values:

```
x=3:y=-3
x=-3:y=3
x=-3:y=-3
```

to see how ABS solves the problem.

Hot on the heels of ABS comes the function SGN. This is used to test the sign of a number or a numeric variable and report if it is negative, positive or zero. Entering the lines:

```
PRINT SGN(3)
PRINT SGN(-9)
PRINT SGN(0)
```

and:

```
variable=7*8+-6
PRINT SGN(variable)
```

into your Electron should show you how SGN works. If the number is negative the function returns –1, if it's positive it returns +1 and if it's zero you get 0 as a result.

You could use SGN in the bank account program, changing our "in the red" line to:

```
IF SGN(amount)=-1 THEN
PRINT "You owe "; ABS
(amount)
```

SGN also comes in handy when we use the SQR function. This gives the square root of the number or variable in the brackets. Try:

```
PRINT SQR(9)
```

and:

```
PRINT SQR(25)
```

to get the idea. The square root of a number is the figure that when multiplied by itself gives the original number. Hence 8 is the square root of 64 as 8 times 8 is 64. Get your Electron to do the multiplication if you have doubts.

However you can only have the square root of positive numbers. Try:

```
PRINT SQR(-4)
```

ABS
EVAL
EXP
INT
LN
LOG
RND
SGN
SQR
VAL

Table II: Functions used with numbers

and all you'll get for your pains is a:

```
-ve root
```

message to tell you that you've asked the Electron to do the impossible. If you just wanted the square root of 4 then you could use ABS to get rid of the negative sign with:

```
PRINT SQR(ABS(-4))
```

You can also use a line like:

```
IF SGN(root)=-1 THEN
root=ABS(root)
```

to trap the cases when the variable *root* is negative and remedy the situation.

The function VAL should cause you no problems, as we met it in the October 1985 issue. Entering:

```
PRINT VAL("123")
```

and:

```
string$="22"
PRINT VAL(string$)
```

should refresh your memory. All VAL does is to take the first figures it comes across in a string and turn them into numbers that you can then do arithmetic with.

If you can't see why that's necessary have a look at the difference between:

```
number$="123"
PRINT number$+2
```

and:

```
number$="123"
PRINT VAL(number$)+2
```

Useful as it is, VAL does have its limitations. It only takes the first few figures of a string up to a non-numeric character. So:

```
PRINT VAL("12w23sd")
```

only gives 12 as its result, while:

```
PRINT VAL("465+9")
```

only gives 465. Everything after the + and the w is ignored.

But what, however, if you wanted to evaluate the numbers in the string "465+9"? What do you do?

One answer would be to use the string-splitting techniques we've been looking at over the past few months to prise out the numbers 465 and 9 from the string and add them together.

However there's a much easier way, as you'll see if you enter:

```
PRINT EVAL("456+9")
```

which adds the two figures in the brackets and gives you the sum.

What EVAL does is to work out the string expression inside the brackets and give you the result as a number. So you can have:

```
number=EVAL("9+9/3")
PRINT number
```

and:

```
number$="1+2+3"
PRINT EVAL(number$)
```

EVAL is a very powerful function, one that's only found in Basics as advanced as the Electron's. At first sight you might not be able to see the point of it, but when you need to use it you'll see how useful it is.

If you want to test your knowledge of strings try explaining why, after:

```
number$="1+2+3"
operator$="+"
multiply$="2"
```

the line:

```
PRINT EVAL(number$
+operator$+multiply$)
```

gives 9. Why does EVAL reach this result and not 12, as you might at first expect? As a clue, try changing *number$* with:

```
number$="(1+2+3)"
```

and see the different result obtained from entering:

```
PRINT EVAL(number$
+operator$+multiply$)
```

again.

The next mathematical functions we'll deal with are the functions LOG, LN, and EXP. These assume that you have some knowledge of logarithms, so if you don't, don't worry too much if you can't understand what they do.

Again, it's a case of when you need to use them you'll understand what they are for.

LOG gives the logarithm to the base 10 of a number. So:

```
PRINT LOG(10)
```

gives 1, the power to which the base 10 has to be raised to equal the number, while:

```
number=20
PRINT LOG(number)
```

gives the common logarithm of *number*.

As well as logarithms to the base 10, you can also take logarithms to the base e, which is known as the Naperian constant and is approximately equal to 2.718. The Electron allows you to do this with the function LN so:

```
PRINT LN(200)
```

gives the Naperian or natural log of 200. Similarly:

```
PRINT LN(2.71828183)
```

gives the natural logarithm of 2.71828183.

The function EXP( ) is e raised to the power of EXP's argument. So:

```
PRINT EXP(3)
```

gives the number which is the result of raising e to the power of 3 (e*e*e) while:

```
PRINT EXP(1)
```

gives the value of e raised to the power of 1, which is, in fact, e.

Leaving logs behind we come to the last of our number-handling functions in the form of INT. It's a lot simpler than the last three functions, as you'll find if you enter:

```
PRINT INT(2.718)
```

or:

```
PRINT INT (8.89)
```

All INT does is to give the integer (whole number) part of a decimal number.

This can be useful when your program is dealing with discrete objects, that is ones that have no fractional part. A program that talked of 1.3 cows or 1.0009 cars would be rather silly. These things are measured in whole units.

So if you've got a decimal number that should be whole to make any sense, INT comes in handy.

If the number is 12.76, you'll find that when you apply INT to it you're left with 12. The fractional part, .76 is just thrown away and you're left with the integer bit. (Obviously you may have to account for this somewhere else in the program.)

Notice that there's no rounding up or down, you just get the whole number part. So in effect you're selecting the first whole number below the number you give to INT as its argument. If you wanted to always round *up* you'd just add 1 as in:

```
PRINT INT(12.76)+1
```

If you want to round to the *nearest* integer add 0.5 to the number inside the brackets of INT as in:

```
PRINT INT(12.76 + 0.5)
```

and:

```
PRINT INT(12.16 + 0.5)
```

And that's where we come to the end of the numeric

→

PETE BIBBY introduces some of the Electron Basic keywords that will enable you to solve real life problems

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functions we'll be dealing with. But not to the end of functions themselves, as you'll see if you take a look at Table III, which shows three functions which give information about the screen layout.

COUNT
POS
VPOS

Table III: Screen layout functions

You already know that the flashing, or print, cursor shows where the next character that you type in at the keyboard will appear on the screen.

All that POS does is to give the position of the print cursor, measured from the left edge of the screen.

Similarly VPOS gives the position of the print cursor, this time measured from the top of the screen. They are measured in numbers of character spaces and rows.

In Mode 6, the mode your Electron is in when you switch on, there are 40 character spaces to a row and 25 rows from the top of the screen to the bottom. Other modes have different screen layouts.

One thing to beware of is that although there are 40 characters across in Mode 6, they are numbered from 0 to 39. The leftmost character space is number 0, the furthest right number 39.

Computers like to start counting at 0, not 1 as we do. The rows go from row number 0 at the top of the screen to row number 24 at the bottom. Figure I shows the numbering system for Mode 6.

Armed with this knowledge, you should have no problem in understanding Program I.

The POS at line 40 is used to find the position of the print cursor after the PRINT of line 30. As there is no comma or semicolon after the "AA" the cursor has gone to the first position on the next line. This means that POS returns 0 which is stored in *xpos* and subsequently displayed.

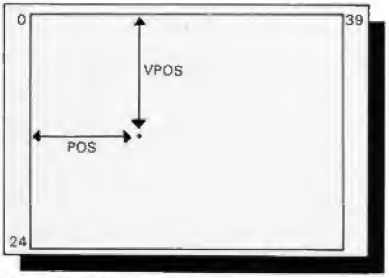

Figure I: Mode 6 rows and columns

```
10 REM PROGRAM I
20 MODE 6
30 PRINT "AA"
40 xpos=POS
50 PRINT "Across ";xpos
60 PRINT "AA";
70 xpos=POS
80 PRINT
90 PRINT "Across ";xpos
100 PRINT
110 xpos=POS
120 PRINT "Across ";xpos
```

Program I

It's a good idea to store the value of POS in a variable for safe keeping. As it changes with successive PRINT statements you can lose track of which POS you want.

The second time "AA" is printed, the semicolon has the effect of "glueing" the cursor to the end of the printed string.

In posh terms, the semicolon suppresses the carriage return normally issued by a PRINT, stopping the cursor from reaching the beginning of the next line as it usually does.

Now POS finds the cursor at the third position from the left, and so 2 is stored in *xpos*. If you think that should be 3, then you've forgotten that we're starting counting at 0.

The final PRINT just prints a blank line, the carriage return works as normal and the cursor goes to the start of the line after the blank one. Hence POS returns 0.

Program II is just a variant of Program I in which VPOS is used to measure the number of rows from the top to the cursor position.

```
10 REM PROGRAM II
20 MODE 6
30 PRINT "AA"
40 xpos=POS:ypos=VPOS
50 PRINT "Across ";xpos,
"Down ";ypos
60 PRINT "AA";
70 xpos=POS:ypos=VPOS
80 PRINT
90 PRINT "Across ";xpos,
"Down ";ypos
100 PRINT
110 xpos=POS:ypos=VPOS
120 PRINT "Across ";xpos
,"Down ";ypos
```

Program II

We'll be coming back to POS and VPOS in a future article. For the time being let's look at the third of our screen layout functions, COUNT.

This measures the number of characters that have been PRINTed since the last carriage return. In practice this means the number of characters displayed since the last PRINT or apostrophe in the list of items following a PRINT. So:

```
PRINT "abcde";:x=COUNT
PRINT x
```

will give a result of 5 and

```
PRINT "abc""de";:x=COUNT
PRINT x
```

will give a result of 2. Notice that POS and COUNT are not the same.

POS gives the position of the print cursor measured in characters from the left, COUNT tallies the number of characters since the last carriage return.

Often they are the same, but not always. Program III makes the difference crystal clear.

```
10 REM PROGRAM III
20 MODE 6
30 PRINT "12345678901234
5678901234567890123456789012
34567890" POS
40 PRINT
50 PRINT "12345678901234
5678901234567890123456789012
34567890" COUNT
60 PRINT
70 PRINT "12345678901234
5678901234567890123456789012
3""4567890" COUNT
80 PRINT
90 PRINT "12345678901234
5678901234567890123456789012
3""4567890" POS
```

Program III

The POS of line 40 has the value of 10. This is what you'd expect, as 10 characters are printed on that row and the cursor is ready and waiting at the eleventh position for another.

Line 50 prints out exactly the same string of figures but now has COUNT at the end. This has the value 50 because 50 characters have been PRINTed since the last carriage return.

So POS and COUNT are different and measure different things. However, as lines 70 and 90 show, they can take the same value at times. They only differ if the line that is PRINTed takes up more than one row.

And I've taken up more than enough lines with this article, so here's where we'll come to an end for this month.

Until the next time, when we'll be looking at more functions, try using the ones we've covered in your programs.

You'll find that your programming skills will have improved enormously.

Will this be Epic's best yet?

EXCLUSIVE news this month is that Epic Software plans to release a massive new adventure in the summer.

After the fantastic success of ***Wheel of Fortune***, they have decided to reward Electron adventurers with the most complex adventure ever.

As yet unnamed, it will feature high resolution graphics with a 64 colour palette and a split-screen display to allow graphics and text to be on screen at the same time.

Epic are naturally reluctant to reveal too much about the game, but it will have about 400 locations and will feature real-time action and character interaction.

It is specifically for the Electron and Epic don't yet know whether they will release it for the BBC Micro. Eat your hearts out Beeb owners!

This month I have had hints and tips from Andrew Clark and, once again, R. Henderson for ***Crown Jewels*** and ***The Incredible Hulk***.

I hereby nominate both of these intrepid adventurers for the Hall of Fame which you will find below.

Larry Horsefield has written in to ask if it is possible to have an adventure "Contact Corner". If you would like an adventure pen-pal let me know and I will publish your address.

If you are one of my younger readers though, I suggest you get your parents' permission first!

It's confession time again. My advice to change into the tweed suit at home in ***Hampstead*** in November's column was wrong. You should get changed in the Oxfam shop.

In the same column I said that the steak in ***Sphinx Adventure*** was past the goblins near the pirate's hideout. I meant the cheese, of course. I knew it was food of some sort. My thanks to the many readers who pointed out these mistakes.

Michael Rocca has seen an advertisement offering Level 9's ***Red Moon*** for the Electron and asks if this is a mistake.

As far as I can discover this is a mistake, as Level 9 seem to have no plans for releasing any of their games on the Electron.

I'd like to thank everyone who sent in maps of the catacombs in ***Sphinx Adventure*** and especially Mike Messam, who not only sent a map but also a screen photograph of the congratulatory message you get when you complete the game.

I notice you took 472 turns to get the 800 points Mike. Has anyone done it in less?

I always thought my cryptic clues were a bit obvious, but Douglas Lockwood, in response to a tip I gave in a previous column to say magic to open the safe in Sphinx Adventure, has written in to say that typing in SAY MAGIC doesn't work!

Would you like me to keep the clues reasonably cryptic or would you prefer them to be more specific?

You may remember my mentioning that the function keys can be programmed before loading in Sphinx Adventure. It seems that it can also be done with ***The Stolen Lamp***. As a general point, function key definitions are stored from &0B00 to &0BFF. Providing the program doesn't overwrite this area it should be possible to program them on any adventure.

Before we leave Sphinx, I'd like to thank Mu de Weger for sending in a map and vocabulary. I wish I'd had this when I was trying to solve it for the special.

I have been asked by a lot of readers to do a special on ***Classic Adventure***.

I have managed to raise

Hall of Fame

Crown Jewels – *Andrew Clark*

You can't attract the policeman's attention so don't bother trying. Go to Tower Bridge and pose for the Japanese tourists – you will get something useful in return. Give the ring to the old man at the station. You can then unlock the cellar door near the Tower of London and get the map. Read it and you will be able to go east at Tower Green to get the torch.

Then go to the Chamber of Horrors. Here you will find some matches and you should use them to melt John Noakes' statue. Move the throne in Buckingham Palace. At Tower Bridge, drug the man's coffee and pull the lever. Cross the bridge and catch the bus to Parliament. You may have to try a few times to catch it. The last treasure is behind the clock face of Big Ben. To finish the game you have to take the jewels back to the guard in the opening location. Make sure that you solve the game as more than a congratulatory message is displayed.

The Incredible Hulk – *R. Henderson*

To get out of the first dome PRESS BUTTON, BITE LIP. Lift the dome to get a gem. Dig a hole then GO HOLE. Keep digging until you find a gem and then go to the fuzzy area. Go to the dome with the bees, wave the fan at the mesh and go inside. Get the wax and leave the dome as the hulk, lift the dome and then dig as before.

Go to the dome with the ants and examine the baseboard in the room. Block the outlet with wax, BITE LIP and ASK STRANGE three times. Get your wax back and go back to the fuzzy area. HOLD NOSE, BLOCK EARS with wax and CLOSE EYES. Go back to the dome with the ants, DIG HOLE, GO HOLE and OPEN EYES. Go up and lift dome then get the ants and go to the fuzzy area.

Go back to the first dome and REMEMBER NIGHTMARE. Go to the room and remember again then pull the ring. Remember again and then GO HOLE. Remember yet again and EAT EGG. Remember for the last time (!) and SCRATCH WALL. Then GO CRACK and DROP ANTS. They will free ant-man and leave you a gem. Go back to the fuzzy area (leave the bio gem).

Go to the Chief Examiner's room and search for the gems (I'll leave that bit to you). Then SAY SCOTT. Go north, get bio gem and then go back to the fuzzy area. Drop the bio gem and you have finished.

Many gems are found lying around and these haven't been included. Drop the gems you find in the fuzzy area at regular intervals. The bio gem must be collected last.

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150 points by collecting all the treasure and have got out of the repository, but have yet to score maximum points.

If you can tell me how to get those missing points, write and let me know how you do it and I will send the first person to do so a copy of Adventure International's new game, ***Robin Hood.***

If there are any other adventures that you would like me to do specials on write in and tell me.

I. Thomas wants to know what in my opinion is the best adventure and adventure software house.

Wheel of Fortune had been number one in both Top Tens and Epic have done well with their other games, so I would say that that answers your question.

David Jackson has written in criticising the inclusion of Classic Adventure in the Top Tens. Well, the rankings in the Top Tens are based on what the consensus of my readers think.

If you don't agree with the results then you should award marks accordingly for the next Top Ten.

In fairness, you are in the minority, David. Most people think that it is a very good adventure.

Jeff Boden has taken me to task for telling Robert Carlton in November's column to type in a code when you have scored all 1,024 points in ***Twin Kingdom Valley.***

As he rightly points out, it is not necessary to type in a code in the game. If you read what I said though, you'll see that I told him to type in the code given in the special.

This was simply a series of letters that, on taking every other letter, gave you the words you actually needed.

The idea was to provide the answer but to make sure that readers who didn't want the answer wouldn't have things spoilt for them on seeing it by accident.

No prizes for spotting what the remaining letters gave!

Finally, here are some tips and solutions to previous month's problems. Someone who prefers to remain nameless has sent in tips for two adventures.

To kill Medusa in ***Gold Baton,*** get and hold the mirror then enter the room. You will find that Medusa has been turned to stone.

In ***SIM,*** take all the similrals straight up from the rabbit, (right to the top of the screen and then as far left as possible).

The grid will open, so go through it and then drop a similral through the hole. If you stay in the room until the similral reaches the bottom you will get an extra life.

Craig Terry and Steve Milner say Eve Thompson's problem with the tetrahedron in ***Kingdom of Klein*** can be solved by keeping east on the Moebius ravine.

Finally, Daniel, who didn't give his surname, has sent in some tips for ***Gremlins.*** When the gremlins follow you go to the cinema and start the projector.

Cut the mail box with the welding torch – you will need the spark indicator that is in the kitchen drawer with the knife.

Weld the resultant plates over the smashed vents in the store then plug in the drill and use it.

Use the hacksaw to get the pipe from the bar in the tavern.

BUG HUNTERS

THIS part of the column exists just to report any bugs found in adventures, and will only make an appearance when readers write in and report some.

There has been quite a lot of

correspondence in these pages over the last few months about the bug that prevents you saving the game in ***Twin Kingdom Valley.***

Mike Horden at first thought he had the bugged version, but in fact found that with the Plus 1 disabled or removed the game worked perfectly.

Would those people who have written in about problems in this game please try again without the Plus 1, if indeed they have it, and let me know whether this bug does in fact exist.

On the subject of the Plus 1, Anthony Lee says that ***Greedy Dwarf*** won't load in at all with it fitted.

The following lines typed in before you start, will disable the Plus 1, so they might be worth trying first before you disconnect it:

```
*FX163,128,1
?&212=&D6:?&213=&F1:?&2AC=0
```

Les Shipton says that there is a bug in ***Woodbury End*** from Shards that crashes the program if you try to open or unlock a locked door in the town hall.

I had already discovered this, as the bug was in my review copy.

Shards assure me that it was only in the very early version of the game and has now been rectified.

As Les also points out, you don't need to use any commands on the doors anyway. As long as you have the keys, moving in the direction of the doors will enable you to go through them.

I must say I am prepared to overlook this bug in view of the quality of the rest of the adventure, which I still haven't solved.

Geoff Larsen – see next time for some of his superb hints and tips – has let me know that there is a faulty copy of Adventure International's ***The Count*** in circulation.

If your copy is version ELC-1/115 and you find that you can't get out of the bedroom window with the sheets (yes, I know you shouldn't want to) or find later that after having used the sheets correctly and gone out of the window that you find it impossible to get back in, then you have the bugged version.

Return it to Adventure International who will, I'm sure, be only too happy to replace it with the newer version converted by Brian Howarth.

SOS

Larry Horsefield has a problem with ***Savage Island Part I,*** an adventure that I have yet to see.

He wants to know what to do after he resurfaces in the lake after diving to retrieve the block and knife.

Each time he tries to get back to the shore he comes up against "something too big" and ends up drowning. Can anyone help him?

Mike Messam has a couple of problems with ***Quest for the Holy Grail.*** Can you get past the fallen rocks, or what do you do there and how do you get past the black knight? Does anybody know?

Michael Buckley can't get into the final location with the dynamite in ***Classic Adventure.*** Does he mean the respository, and what dynamite is he talking about?

Craig Romans is stuck in ***Terrormolinos.*** He can't get out of the "inevitable dark location", switch on or get light or find the film for the camera.

Carl Barlow has scored 95 per cent in ***Hampstead*** but can't get any further. He also says that he has translated the motto. What motto?

Nicholas Latham has written in with some questions on ***Bored of the Rings,*** which I think is a BBC Micro adventure.

He wants to know how to get through the gate on the lakeside, where pepper comes into the game and what you are supposed to do after the meeting.

The only tip I have heard about this game is that you can increase your score by swearing!

Someone who hasn't given his name (probably can't stand the notoriety!) wants to know what object you need to get the baton at the end of ***Gold Baton.***

PROBLEM CORNER

There has been a shortage of problems this month, probably due to last time's Sphinx special.

Marilyn Rodger and Stuart Kelly both want to know what the route through the jet black maze in ***Castle of Riddles*** is. From the alcove go E,N,E,NW,N,N,NE,W.

Stephen Henderson and Robert Carlton are having problems with ***Wheel of Fortune.***

Pay the beggar and he won't let go when you are only partway down the well. The gun is for the werewolf and use the ladder to cross the pit.

Kristian Took wants to know where the crystal gate is in ***Twin Kingdom Valley.*** If I'm thinking of the same thing as you I would wave the rod at the chasm.

David Jackson wants to know how to make the beans grow and Steve Parkinson wants to know how to get out of the castle in ***Eye of Zoltan.***

Dig a hole, plant the beans and then water them. Courtesy of Eve Thompson and Les Shipton, I can suggest that saying minotaur will get you out.

B. Whittle can't get past the giant in ***Kingdom of Klein.*** Rise to the occasion and stone him.

Paul Joels wants to know how to get past the enchantress and where to find the sledgehammer in ***Stolen Lamp.*** Drop the bracelet and search the desert.

In ***Hampstead,*** Derek Willoughby would like to know how to open the filing cabinet and what to say to the butler. Use the screwdriver from the store and tell him to see chubby.

David Roberts has scored 239 out of 250 points in ***Philosopher's Quest.*** He wants to know how to get past the pool of ink.

Shouldn't you be filling something here rather than trying to get past?

Chris Shadworth has some questions about ***Ring of Time.*** Where is the rope, how can he get the password to the safe and is there anything in the supply shed?

The rope is past the mad monk. Burn the parchment to get the combination. The matches are in the supply shed.

Con Carey wants to know how to get past the dog and where to find the dwarf's hut in ***Greedy Dwarf.*** Give the dog a bone. The hut is past the dog.

Quest for the Holy Grail is causing Mike Messam some problems. The banana and the hammer aren't used. You can't ride the horse.

Throw the cask of oil at the dragon. Climb the huge oak tree. The angry shouts mean that the woodcutter has realised his axe is missing.

Mike Horden wants to know how to open the locked doors and how to remove the large grate in ***Mystery Fun House.*** You can't. Remove the bolt with the wrench and slide the grating off.

Gisbourne's Castle has prompted a lot of questions. I have still not seen it so I can't really give much help. I can give you what information I have got though, so for Matthew Shepard, Stuart Taylor, P. Taylor and Mohd Sharif, here is an extract from a letter that gives all I know about the game:

"When you want to go into the dungeons use the rope and then the key. You need poison arrows to kill the creatures in the castle.

"If you dig with the spade when you are in the dungeon you will go into the cellars and somewhere in there you will find Gisbourne.

"Here you will need a flint, gunpowder and shot. You get the shot from the room with the rusty lock – use the oil, bottle and the shrinking potion.

"When you kill Gisbourne you will find a small key which will allow you to enter the chapel and rescue Maid Marion".

If Chris Wray, the writer of the letter, can send me a full map and solution that I can understand – don't forget I haven't seen the game – then I'll reward him with a free adventure.

CONTACT CORNER
Larry Horsefield, 40 Harvey Gardens, Charlton, London SE7 8AJ.

Ready-made ROMs from RAM

What is sideways RAM – and how do you make the most of it? ROLAND WADDILOVE explains

THERE has been quite a bit of interest in sideways RAM for the Electron recently, so in this article we're going to see what it is and have a look at some of its uses.

The two main producers of sideways RAM are Slogger and Advanced Computer Products.

Although virtually identical in operation, the two products are different in the way they are fitted. Slogger's sideways RAM plugs into their Rombox, whereas ACP's is in a cartridge which plugs in to the Plus I.

Before we look at sideways RAM we'll have to consider the more permanent sideways ROMs.

The Electron is able to support a number of ROM-based programs, all occupying the same area of the memory map.

Each ROM occupies the address space between &8000 and &BFFF. When a particular ROM is required it is turned on, or paged in, by the operating system and then paged out when the software on another ROM is needed.

There are two types of ROMs – language ROMs such as Acornsoft's Logo and Lisp, and service ROMs providing utilities such as ACP's ADT and Slogger's ElkMan.

Although only one ROM is paged in at a time, any ROM can ask another service ROM to do a job or service for it.

Language ROMs aren't so helpful. Only one can be active at a time – they are paged in and can't request help from any other languages in ROM.

When a request for a service is made the operating system interrogates each ROM in turn until the request is acted upon. The request is made by paging in each ROM and jumping to a specific machine code routine via a service entry point.

This routine then decides whether the ROM will respond to the request or choose to ignore it.

What would happen if RAM were mapped into the address space where a ROM normally exists?

Well, unless the right machine code had been placed in the RAM the operating system simply wouldn't recognise it. It certainly couldn't be used for extending the memory for Basic programs.

If the correct machine code for a ROM is placed in the RAM, creating a ROM look-a-like in the RAM, the operating system will treat it as if it were indeed a ROM.

Sideways RAM has many uses. It's quite possible to have more ROMs for the Electron than ROM sockets. In addition, if you have several ROMs it sometimes happens that they interfere with each other in some way.

A third problem is caused by the Electron's annoying habit of switching to the first language ROM it finds after pressing Ctrl+Break. Basic only being used as a last resort.

This means that you often end up in View, Viewsheet, Starmon or whatever you've got plugged in, when you really want Basic.

In these cases it's convenient to save each of the ROMs to disc or tape. Then, when a particular ROM is required, it can be loaded back into the sideways RAM.

Both Slogger and ACP provide utilities for saving ROMs and loading them back into RAM, making the process as simple as possible.

Breaking the buffer barrier

Those who frequently use a printer for listings or word processors will know how frustratingly slow they can be.

The Electron stores the text to be printed in a buffer – a sort of data reservoir. But as this is only about 60 bytes long it can't fit much text in and the Electron can fill it much faster than the printer can empty it.

So when printing, the tendency is for the Electron to be hanging about waiting for the slower printer to empty the buffer.

The speed problem can be overcome by increasing the size of the Electron's printer buffer. Once the last of the text is in the buffer the Electron can get back to the program, leaving the printer to empty the buffer in its own sweet time.

Both systems provide utilities to enable sideways RAM to be used as a buffer up to 14 or 15k long.

Much more storage space

Sideways RAM is a convenient place to store your machine code utilities. For instance, the screen dump in the March 1985 issue of *Electron User* can be placed here. Virtually no change is necessary.

There are two big advantages in placing the routines here. Firstly it doesn't use any of the RAM needed by Basic, so there's no loss of memory. Secondly there's an increase in speed.

When a ROM is being accessed the Electron's 6502 processor runs at the maximum possible speed of 2MHz. When it needs to access RAM it has to slow down to 1MHz.

Also if the Electron is running in Modes 0, 1, 2 or 3 the ULA has priority over RAM and the processor can be frozen for relatively long periods.

Since sideways RAM is treated as a ROM the processor still runs at maximum speed when accessing it. In a test a delay loop in machine code took 0.38 seconds when running in normal RAM (in Mode 6).

The same loop when placed in sideways RAM took 0.18 seconds – twice as fast and identical to the time taken on the BBC Micro!

Also there's hardly any loss in speed in Modes 0 to 3, making it up to three times faster than normal.

Of course if the routine has to access ordinary RAM the processor must slow down, but there will always be some speed increase.

Imagine how good games would be if they were designed to run in sideways RAM with its fantastic speed increase . . .

If you are fairly familiar with machine code you shouldn't find it too difficult to adapt your routines to run in sideways RAM.

The code placed in the RAM must be written in the form of a ROM. If the operating system is to recognise it, it must have the correct header.

This is followed by the machine code routines which provide the language or service required. Figure I shows the format of the header for a paged ROM.

The language entry is a JMP to the entry code. If the ROM isn't a language these bytes should be zero. The service entry should be a JMP to some code to respond to service calls.

The ROM type byte describes the ROM. Figure II shows the significance of each of the bits.

The copyright offset pointer is an offset from the beginning of the ROM to the zero byte preceding the copyright string.

The version number can be any value. The title string is the string printed if the ROM is entered as a language. The version string identifies the release number of the software. The copyright string is essential and should start

Offset	Bytes	Function
0	3	Language entry (JMP address).
3	3	Service entry (JMP address).
6	1	ROM type flag.
7	1	Copyright string offset pointer.
8	1	Version number (binary).
9	t	Title string.
9+t	1	Zero byte.
10+t	v	Version string.
10+t+v	1	Zero byte.
11+t+v	c	Copyright string.
11+t+v+c	1	Zero byte.
12+t+v+c	4	2nd processor relocation address.
16+t+v+c	–	Rest of ROM code.

Figure I: ROM header

In a test, a delay loop in sideways RAM took the same amount of time as on a BBC Micro – twice as fast as the Electron's normal RAM.

with a zero byte followed by (C).

The Tube relocation address is the address the ROM should be copied to if a second processor is present.

The Toolkit

A service ROM is by far the easiest type of ROM to write. The program accompanying this article, Toolkit, is the source code for a service ROM providing the Electron with four new star commands.

They are *MONITOR, *STATUS, *DOUBLE and *BEEP.

The last is fairly obvious, it merely produces a beep. *DOUBLE is a double height print routine.

```
*DOUBLE Electron User
```

prints *Electron User* in double height characters at the current print position in the current foreground and background colours.

*STATUS prints the value of PAGE, TOP, LOMEM, HIMEM, WIDTH, the status of TRACE, the length of any Basic program in memory, the space taken up by its variables and the amount of free memory left.

The main command is *MONITOR. This is a hexadecimal and Ascii memory lister.

It is more useful than most, not because it is in sideways RAM, but because it constantly scans from the address given and updates the screen several times a second. Consequently any memory locations that change are instantly noticeable.

It takes the value of *A%* as the address to start scanning from. The Escape key exits from the monitor.

The most interesting part of the memory to examine is the first few pages of RAM. They are used by the operating system and the current language as storage for variables.

The stack and various counters can be seen ticking away here.

Toolkit was written using ACP's sideways RAM in socket 0 in the Plus 1. An additional procedure, PROC_RAMwrite, has been included to copy the object code into sideways RAM.

Alternatively the object code could be saved to tape or disc. If you have ACP's RAM cartridge use *ASR to transfer it to sideways RAM.

If you have Slogger's RAM use ElkMan's *RLOAD to transfer it. When the code has been placed in sideways RAM press Ctrl+Break to initialise it otherwise the Electron won't know it's there.

The ROM code is assembled in PROC_ROM-code. You'll see that it assembles the code with OPT 4 and 6 in line 150. This forces the assembler to assemble the code as if it was at *P%* but place it in the memory at *0%*.

Toolkit provides a ready-made ROM. Adding your own routines is quite straightforward.

Place the name of the command in the name table starting at line 320. The address of the routine is placed immediately following the name, high byte first then the low byte.

When your star command is executed your routine will be entered with the Y register pointing to the first character following the name. This enables you to pick up any parameters which may be needed.

When you've finished use:

```
JMP return
```

instead of RTS. If you need to print a hexadecimal number then:

```
JSR hexprint
```

and to print a string:

```
JSR pstring:EQUS "line of
text":EQUB 0:\rest of code
```

The Electron Advanced User Guide is essential reading if you want to write a full ROM. Four chapters are devoted entirely to the different types of ROM, their format and all the paged ROM service calls are described in detail.

I hope I've given you an idea of what sideways RAM is capable of. It opens up so many new possibilities that, once you've got it – and I recommend you do – you'll wonder how you managed without it.

Bit	Function
0 to 3	0=6502 Basic / 1=reserved 2=6502 code / 3=68000 code 8=Z80 code / 9=16032 or 32016
4	Controls firm key expansions.
5	Indicates ROM has relocation address.
6	Indicates that this is a language.
7	Indicates that there is a service entry.

Figure II: ROM type byte.

From Page 51

```
  10 REM Toolkit ROM
  20 REM By R.A.Waddilove
  30 REM (c) Electron User
  40 MODE 6
  50 PROC_RAMwrite
  60 CLEAR
  70 PROC_ROMcode
  80 END
  90
 100 DEF PROC_ROMcode
 110 line=&F2:osasci=&FFE3
:osword=!&20C AND &FFFF:osw
rch=!&20E AND &FFFF:osbyte=
!&20A AND &FFFF:osnewl=&FFE
7:AX=&484
 120 temp=&A8:pointer=&A8:
counter=&A9
 130 Areg=&AA:Xreg=&AB:Yre
g=&AC:row=&AD:address=&AE
 140 ascii=&100:block=&100
 150 FOR pass=4 TO 6 STEP
2
 160 P%=&8000:O%=&4000
 170 [OPT pass
 180 \*********************
 190 .rom  \ROM header
 200 EQUW 0:EQUB 0  \not a
 language
 210 JMP service  \entry p
oint
 220 EQUB &82  \ROM type
 230 EQUB (copyright-rom)
 \copyright offset
 240 EQUB 0  \not used
 250 .title EQUS "Toolkit"
 260 EQUB 0  \end
 270 EQUS "1.00 "
 280 .copyright EQUB 0  \e
nd
 290 EQUS "(C) 1986 Electr
on User"  \copyright string
 300 EQUB 0
 310 \*********************
 320 .nametable  \Commands
 330 EQUS "MONITOR":EQUB (
monitor-1)DIV256:EQUB (moni
tor-1)MOD256
 340 EQUS "STATUS":EQUB (s
tatus-1)DIV256:EQUB (status
-1)MOD256
 350 EQUS "DOUBLE":EQUB (d
ouble-1)DIV256:EQUB (double
-1)MOD256
 360 EQUS "BEEP":EQUB (bee
p-1)DIV256:EQUB (beep-1)MOD
256
 370 EQUW 0
 380 \*********************
 390 .service PHP  \servic
e entry point
 400 CMP #4:BEQ command  \
our command?
 410 CMP #9:BEQ help  \*HE
LP?
 420 CMP #2:BEQ workspace
 \claim workspace?
 430 PLP:RTS
 440 \*********************
 450 .workspace
 460 JSR store  \save regi
sters
 470 JSR pstring:EQUB &0D:
EQUS"Electron User ROM":EQU
W &00
 480 JMP exit
 490 \*********************
 500 .help  \print title s
tring
 510 JSR store  \save regi
sters
 520 JSR osnewl
 530 .h1 JSR pstring:EQUS"
Toolkit":EQUW &0D
 540 .exit
 550 LDA Areg:LDX Xreg:LDY
 Yreg:PLP:RTS
 560 \*********************
 570 .command
 580 JSR store
 590 LDX #0
 600 .loop1
 610 LDA (line),Y:AND #&DF
:CMP nametable,X:BNE c1
 620 INY:INX:JMP loop1
 630 .c1
 640 CMP #0:BEQ c3
 650 CMP #&0D:BEQ c3
 660 .c6
 670 LDY Yreg  \doesn't ma
tch
 680 .c4 LDA nametable,X:B
MI c5
 690 INX:JMP c4
 700 .c5 INX:INX:LDA namet
able,X:BNE loop1
 710 JMP exit
 720 .c3 LDA nametable,X:B
PL c6
 730 PHA:LDA nametable+1,X
:PHA:RTS  \jump to routine
 740 \*********************
 750 .pstring  \print stri
ng
 760 PLA:STA temp:PLA:STA
temp+1  \get string address
 770 LDY #0:BEQ ps2
 780 .ps LDA (temp),Y:BEQ
ps1:JSR osasci  \zero ends
 790 .ps2 INC temp:BNE ps:
INC temp+1:BNE ps
 800 .ps1 LDA temp+1:PHA:L
DA temp:PHA
 810 RTS
 820 \*********************
 830 .cursor
 840 LDA #23:JSR oswrch:LD
A #1:JSR oswrch:TXA:JSR osw
rch:LDA #0:LDX #7
 850 .loop1 JSR oswrch:DEX
:BNE loop1
 860 RTS
 870 \*********************
 880 .monitor
 890 JSR pstring:EQUW &061
6:EQUB &0D:EQUS "
Memory Monitor":EQUW &0D0D
:EQUS " Addr           Hex
          Ascii":EQUB 0
 900 LDY #0:JSR cursor
 910 LDA #10:STA ascii:LDA
 #&0D:STA ascii+1
 920 .mon2
 930 LDA #31:JSR oswrch:LD
A #0:JSR oswrch:LDA #5:JSR
 oswrch  \TAB(0,5)
 940 LDA AX:STA address:LD
A AX+1:STA address+1  \moni
tor address
 950 LDA #16:STA row
 960 .loop2
 970 LDA address+1:JSR hex
print:LDA address:JSR hexpr
int
 980 LDA #9:JSR oswrch:JSR
 oswrch
 990 LDY #0:LDX #8
1000 .loop1
1010 LDA (address),Y:JSR p
rint
1020 LDA #9:JSR oswrch
1030 INY:DEX:BNE loop1
1040 TAY
1050 .str1 LDA ascii,Y:JSR
 oswrch:DEY:BPL str1
1060 CLC:LDA address:ADC #
8:STA address:BCC ac:INC ad
dress+1
1070 .ac DEC row:BNE loop2
1080 LDA #&81:LDX #&0F:LDY
 #&FF:JSR osbyte:TYA:BEQ mo
n1
1090 LDY #1:JSR cursor
1100 .return LDA #0:STA Ar
eg:JMP exit
1110 .mon1
1120 LDA #&81:LDX #&C6:DEY
:JSR osbyte:TYA:BEQ ma
1130 CLC:LDA AX:ADC #16:ST
A AX:BCC md:INC AX+1
1140 .md JMP mon2
1150 .ma LDA #&81:LDX #&D6
:DEY:JSR osbyte:TYA:BEQ mb
1160 SEC:LDA AX:SBC #16:ST
A AX:BCS mb:DEC AX+1
1170 .mb JMP mon2
1180 .print
1190 PHA:AND #&7F:CMP #&7F
:BNE pr1
1200 .pr2 LDA #ASC".":JMP
pr3
1210 .pr1 CMP #ASC" ":BCC
pr2
1220 .pr3 STA ascii+1,X:PL
A
1230 .hexprint PHA:LSR A:L
SR A:LSR A:LSR A:JSR printi
t
1240 PLA
1250 .printit
1260 AND #&0F
1270 SED:CLC:ADC #&90:ADC
#&40:CLD
1280 JMP oswrch
1290 \*********************
1300 .beep
1310 LDA #7:JSR &FFEE
1320 JMP return
1330 \*********************
1340 .status
1350 JSR pstring:EQUS "PAG
E=&":EQUB 0
1360 LDA &10:JSR hexprint:
LDA #0:JSR hexprint:JSR osn
ewl
1370 JSR pstring:EQUS "TOP
=&":EQUB 0
1380 LDA &13:JSR hexprint:
LDA &12:JSR hexprint:JSR os
newl
1390 JSR pstring:EQUS "LOM
EM=&":EQUB 0
1400 LDA &01:JSR hexprint:
LDA &00:JSR hexprint:JSR os
newl
1410 JSR pstring:EQUS "HIM
EM=&":EQUB 0
1420 LDA &07:JSR hexprint:
LDA &06:JSR hexprint:JSR os
newl
1430 JSR pstring:EQUS "Pro
gram=&":EQUB 0
1440 SEC:LDA &13:SBC &10:J
SR hexprint:LDA &12:JSR hex
print:JSR bytes
1450 JSR pstring:EQUS "Var
iables=&":EQUB 0
1460 SEC:LDA &02:SBC &12:T
AX:LDA &03:SBC &13:JSR hexp
```

```
rint:TYA:JSR hexprint:JSR b
ytes
 1470 JSR pstring:EQUS "Fre
e=";EQUD @
 1480 SEC:LDA &06:SBC &02:T
AY:LDA &07:SBC &03:JSR hexp
rint:TYA:JSR hexprint:JSR b
ytes
 1490 LDA &20:BED st1
 1500 JSR pstring:EQUS "TRA
CE ON":EQUD 0:JMP st2
 1510 .st1 JSR pstring:EQUS
 "TRACE OFF":EQUD 0
 1520 .st2 JSR osnewl
 1530 JSR pstring:EQUS "WID
TH ";EQUD 0
 1540 LDX &23:INX:TXA:JSR h
exprint:JSR osnewl
 1550 JMP return
 1560 .bytes JSR pstring:ED
US " bytes";EQUW &0C:RTS
 1570 \**********************
 1580 .store \save registe
rs
 1590 STA Area:STY Xreg:STY
 Yreg
 1600 RTS
 1610 \**********************
 1620 .double \double heig
ht characters
 1630 LDA (line),Y:CMP #&00
:BED d2
 1640 \Y+1 points to first
character
 1650 .loop1 INY
 1660 LDA (line),Y:STY temp
:CMP #&20:BED d2:STA block
 1670 LDA #10:LDX #block MO
D256:LDY #block DIV256:JSR
 oswrd
 1680 LDA #23:JSR oswrch:LD
A #255:JSR oswrch
 1690 LDX #0:.d1 LDA block+
1,X:JSR oswrch:JSR oswrch:I
NX:CPX #4:BNE d1
 1700 LDA #255:JSR oswrch:L
DA #8:JSR oswrch:LDA #10:JS
R oswrch
 1710 LDA #23:JSR oswrch:LD
A #255:JSR oswrch
 1720 .d1 LDA block+1,X:JSR
 oswrch:JSR oswrch:INX:CPX
#8:BNE d1
 1730 LDA #255:JSR oswrch:L
DA #11:JSR oswrch
 1740 LDY temp:JMP loop1
 1750 .d2 JMP return
 1760 \**********************
 1770 ]
 1780 NEXT
 1790 A%=0:B%=USR(&C00)
 1800 ENDPROC
 1810
 1820 DEF PROC RAMwrite
 1830 from=&70:to=&72
 1840 FOR I%=0 TO 2 STEP 2
 1850 P%=&C00
 1860 [OPT I%
 1870 \RAM socket number in
 A
 1880 LDX &F4 \save curren
t ROM
 1890 LDY #&0C \deselect B
asic
 1900 STY &F4:STY &FE05
 1910 STA &F4:STA &FE05 \s
elect ROM
 1920 LDY #0
 1930 SEI:STY &FCDC:STY &FC
DE \unlock
 1940 STY from:STY to
 1950 LDA #&40:STA from+1
 1960 LDA #&80:STA to+1
 1970 .loop
 1980 LDA (from),Y
 1990 STA (to),Y
 2000 CLC:LDA from:ADC #1:S
TA from
 2010 LDA from+1:ADC #0:STA
 from+1
 2020 CLC:LDA to:ADC #1:STA
 to
 2030 LDA to+1:ADC #0:STA t
o+1
 2040 CMP #&84:BNE loop
 2050 STY &FCDD:STY &FCDF:C
LI \lock
 2060 STX &F4:STX &FE05 \o
riginal ROM
 2070 RTS
 2080 ]
 2090 NEXT
 2100 ENDPROC
```

This listing is included in this month's cassette tape offer. See order form on Page 61.

ROMs

Plus 3 owners can now have a DFS compatible with the BBC B+ . . . ROLAND WADDILOVE reviews the ROM involved

ONE of the disadvantages of the Plus 3's Advanced Disc Filing System is its total incompatibility with the disc filing system used by the BBC Micro.

This means that files saved to disc using a BBC Micro are unreadable by the Electron's ADFS. It's frustrating if, like me, you work on both micros.

The only solution is to resort to unreliable tape recorders again, which defeats the object of investing in a disc system.

Having realised this, Advanced Computer Products has come up with a superb 1770 DFS. This ROM provides Plus 3 owners with essentially the same disc filing system as used in the BBC B+.

It enables files to be saved to disc on an Electron and loaded into the BBC Micro, and vice versa.

The DFS can be fitted inside one of ACP's blank cartridges and plugged in to one of the Plus 1 sockets. Alternatively it can be placed in something like Slogger's Rombox.

The bad news is that PAGE is set to &1F00 with both the ADFS and DFS enabled. That means there's little memory left in Modes 0 to 2.

The good news is that with just the DFS enabled PAGE is reset to &1900, providing you with an extra 1k of RAM.

Files can even be loaded and saved with PAGE set as low as &1100.

Of course there's no real need for both the ADFS and DFS to be used at the same time, unless you're copying from ADFS format discs to DFS format ones.

This is a piece of cake. Select the ADFS with *ADFS, load your file, select the DFS with *DISC and save it on a DFS disc.

Copying in the reverse direction from DFS to ADFS is just as simple. However there's a problem here if the object is to transfer files from the Electron to the BBC Micro or vice-versa.

The most common disc size on the BBC Micro is 5¼in, but the Electron uses 3½in.

Naturally, if you use 3½in discs with the BBC Micro you can use the same discs on both.

A way round the problem would be to hook up a 5¼in. drive to the back of the Plus 3. Then it's possible to have the DFS on the external drive and ADFS on the Plus 3 drive, and alternate between the two combinations.

The Electron can then access either the BBC DFS format discs on the external drive or Electron ADFS discs on the Plus 3 drive and copy one to the other.

ACP's Advanced Disc Toolkit can enable and disable either ROM.

This is a handy thing to have around when PAGE can be set so high. Alternatively the ADFS can be disabled by simply storing &9C in &DF4 and pressing Break.

What you get with the DFS and Plus 3 is a single density 80 track single-sided disc system. There's a fraction over 200k of storage space on the disc but unfortunately, as it's compatible with the BBC Micro's now outdated DFS, you are restricted to only 31 files.

It's very easy to fill the catalogue while there's still space on the disc. This compares with 320k of space on the double density ADFS discs and an unlimited number of files.

It's widely accepted that the BBC Micro's DFS is rather poor, so I won't labour the point. The big advantage for the Electron Plus 3 owner is the compatibility with the BBC Micro.

One thing I didn't try was loading protected commercial BBC software. You're quite likely to have some problems here – even the BBC B+ has problems loading BBC software!

The reason is that most protection systems take advantage of the peculiarities of that antiquated museum piece, the 8271 disc controller.

The 1770 disc controller in the BBC B+ and Plus 3 can't quite emulate it. Still, it's good enough for any unprotected software.

Figures I and II show the DFS commands. Most will be familiar to Plus 3 owners, so I'll only mention the commands which aren't used by the ADFS.

```
*HELP DFS
Expansion 1.00
  ADC/Printer/RS423

DFS 2.10
  ACCESS    <afsp> (L)
  BACKUP    <source> <dest.>
  CLOSE
  COMPACT   (<drive>)
  COPY      <source> <dest.> <afsp>
  DELETE    <fsp>
  DESTROY   <afsp>
  DIR       (<dir>)
  DRIVE     <drive> (40) (80)
  ENABLE
  EX        (<dir>)
  FORM      40/80 (<drive>)...
  FREE      (<drive>)
  INFO      <afsp>
  LIB       (<dir>)
  MAP       (<drive>)
  RENAME    <old fsp> <new fsp>
  TITLE     <title>
  VERIFY    (<drive>)...
  WIPE      <afsp>

OS 1.00
```

Figure I: DFS commands

```
3*HELP UTILS
Expansion 1.00
  ADC/Printer/RS423

DFS 2.10
  BUILD     <fsp>
  DISC
  DUMP      <fsp>
  LIST      <fsp>
  ROMS      (<rom>)
  TYPE      <fsp>

OS 1.00
```

Figure II: DFS utilities

Notice that all the utilities are in the DFS ROM. This is much more convenient than having them on disc as with the ADFS.

Filenames are restricted to seven letters and directories only a single letter. The whole of the contents of the disc are displayed when it's catalogued, not just the currently selected directory. Unfortunately it tends to create a messy display.

Here's a brief description of the new commands the DFS will give you:

***COPY** is used to copy files from one disc to another.

***WIPE** is a nice command. It deletes a file but prints its name and asks if you're sure before doing so.

***ENABLE** enables powerful commands such as ***DESTROY** to work. It's a relic from early Acorn DFSs and isn't needed on the latest versions.

***DISC** selects the DFS – Ctrl+D+Break does as well. ***ROMS** is a useful addition although it's really nothing to do with the DFS. It prints a list of the ROMs present in the micro.

Although moving over to the DFS after using the ADFS may be considered a retrograde step because of the limitations mentioned above, there are several reasons why it may be desirable.

Most important is that the DFS is as compatible as possible with the BBC Micro's DFS.

All unprotected software loaded and saved perfectly on the same discs using both the BBC Micro and Electron.

ACP has produced another superb ROM for the Electron. If you use both the BBC Micro and Electron the Plus 3 and DFS is by far the best disc system to go for.

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- ★ REPEAT . . . UNTIL, the building blocks of loops
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On the January 1985 tape:
SPACE BATTLE Destroy the deadly descending aliens! **NEW YEAR** A sound and graphics greeting. **ESCAPE FROM SCARGOV** Minefield action. **PIE CHART** Statistics made simple. **CLAYPIGEON** An Electron birdshoot. **ORGAN** Music maestro please! **NOTEBOOK** An original program. **RANDOM NUMBERS** Or not so random! **SNAKES** Reptilean arcade action. **CHEESE RACE** Beat rival mice.

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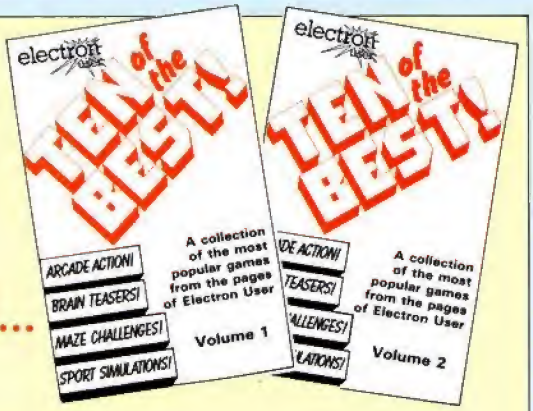

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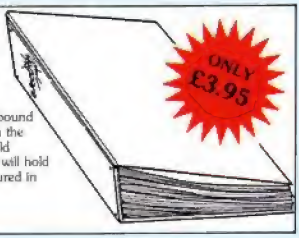

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It all fits together like peas in a pod

OVER the past few months we've looked at the techniques needed to produce a machine code game. We've examined the screen memory map, looked at reading the keyboard and seen how to handle collision detection.

To see how it all fits together and round off the series, I've written the bare bones of a machine code game. It's only relatively short and simple, but it does show how the various routines combine to produce an arcade game.

Pea Shoot involves shooting balloons with a pea shooter as they gently float skywards. If you manage to hit a balloon you will be rewarded with a pop. The space bar is used as the fire button.

You'll have met many of the routines earlier in the series, so there's very little that should be new to you.

If you entered the collision detection demonstration last time you can save yourself a lot of typing this month. Pea Shoot was developed from this.

The balloons start off at a random position at the bottom of the screen and float upwards. The random number generator in the Basic ROM at &AF12 provides the x coordinate.

The routine is the equivalent of Basic's RND(X). The number is placed in a four byte block of workspace at &2A. The result is placed back in the four byte work space.

The game starts by putting the man on the screen. The main loop calls *up* to move the balloon up, *peas* to move the peas and *hit* to see if the peas have hit the balloon.

The collision detection routine we looked at last time is unnecessary in a very simple game like Pea Shoot.

Since the peas only take up one byte of screen memory all we need to do is check that this byte hasn't been corrupted.

If it's been altered then it must have hit the balloon. The balloon is replaced with an explosion and an appropriate sound made.

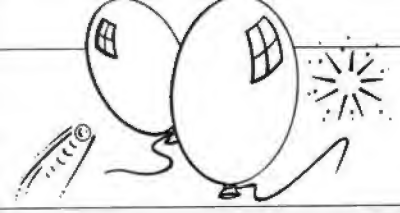
I've done all the hard work, it's up to you to add a score routine, high score table and instructions. These are relatively simple.

That's all there is to it. Writing an arcade game isn't as difficult as you think. You've got all the routines you need, so it's just a matter of linking them together.

I hope you've enjoyed this short series and learnt a few new techniques.

Think of me when you're earning thousands of pounds from your super zap 'em mega arcade game.

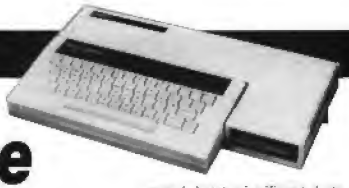
```
  10 REM ** Pea  Shoot! **
  20 REM Example machine
  30 REM  code  game.
  40 REM By R.Waddilove
  50 REM (c) Electron User
  60 ON ERROR GOTO 80
  70 *FX163,128,1
  80 ON ERROR OFF
  90 FOR byte=0 TO 191
 100 READ data
 110 byte?&C00=data
 120 NEXT
 130 PROCassemble
 140 MODE 5:VDU 23,1,0;0;0
;0;19,3,5;0;
 150 VDU23,255,170,85,170,
85,170,85,170,85
 160 VDU23,254,40,84,170,8
5,170,85,42,20
 170 GCOL 0,2:VDU5
 180 FORIT=1TO10
 190 X%=RND(1280):Y%=RND(2
00)+824
 200 FORJ%=1TO10
 210 MOVEX%+RND(100),Y%+RN
D(50):VDU254
 220 NEXT
 230 NEXT
 240 VDU4
 250 COLOUR 1:COLOUR 130:P
RINT TAB(0,31)STRING$(19,CH
R$255);
 260 COLOUR 3:PRINT TAB(0,
22)STRING$(9,CHR$255+CHR$25
5+CHR$10+CHR$8+CHR$8);
 270 VDU30:CALL &900
 280 END
 290
 300 DEF PROCassemble
 310 old=&70:new=&72:rows=
&74:columns=&75:tempcpl=&76
:temp1=&78
 320 address=&80:xI=&82
 330 alien=&84:ayI=&87
 340 osbyte='&20A AND &FFF
F:osword='&2BC AND &FFFF
 350 FOR pass=0 TO 2 STEP
2
 360 P%=&900
 370 [ OPT pass
 380
 390 LDA #0:STA xI  \pea f
lag
 400 LDA #&CB:STA new:LDA
#&6F:STA new+1  \put man on
 screen
 410 LDA #&48:STA newdata+
1:LDA #&BC:STA newdata+2
 420 LDX #2:STX columns:LD
Y #24:STY rows:LDY #0:JSR p
ut
 430
 440 .start
 450 JSR new_balloon
 460 .loop
 470 JSR up
 480 JSR peas
 490 JSR hit
 500 LDA #&81:LDX #&8F:LDY
 #&FF:JSR osbyte:TYA:BEQ lo
op  \Escape pressed?
 510 RTS  \return to Basic
 520
 530 .new_balloon
 540 LDA #&7B:STA alien+1:
LDA #&00:STA alien  \base a
ddress
 550 STA&2B:STA&2C:STA&2D:
LDA #100:STA &2A:JSR &AF12
 \RND(100)
 560 .wait LDA #19:JSR osb
yte:JSR peas:DEC &2A:BNE wa
it
 570 LDA #30:STA &2A:JSR &
AF12:LDA &2A:CLC:ADC #6  \R
ND(30)+6
 580 ASL A:ASL A:ASL A:ROL
 &28  \A*8...offset
 590 .draw
 600 ADC alien:STA alien:S
TA new:LDA alien+1:ADC &28:
STA alien+1:STA new+1
 610 LDA #224:STA ayI  \se
t y coordinate
 620 LDA #&00:STA newdata+
1:LDA #&0C:STA newdata+2
 630 LDX #3:STX columns:LD
Y #24:STY rows:LDY #0:JMP p
ut
 640
 650 .hit  \simple collisi
on detection
 660 LDA xI:BNE test:RTS
 670 .test
 680 LDY #0:LDA (address),
Y:EOR #&F0:BNE hitit:RTS  \
```



Part 6 of ROLAND WADDILOVE's series on programming graphics with arcade games in mind

```
hit balloon?
  690 .hitit STA (address),
Y:STY x%  \remove peas
  700 LDA alien:STA old:STA
 new:LDA alien+1:STA old+1:
STA new+1
  710 LDA #&00:STA olddata+
1:LDA #&0C:STA olddata+2
  720 LDA #&78:STA newdata+
1:LDA #&0C:STA newdata+2
  730 LDY #3:LDY #24:JSR pr
int
  740 LDA #7:LDY #sound1 MO
D256:LDY #sound1 DIV256:JSR
 osword
  750 LDA #10:STA ay%
  760 .wait1 LDA #19:JSR os
byte:JSR peas:DEC ay%:BNE w
ait1
  770 LDA alien:STA new:LDA
 alien+1:STA new+1
  780 LDA #&78:STA newdata+
1:LDA #&0C:STA newdata+2
  790 LDY #3:STX columns:LD
Y #24:STY rows:LDY #0:JSR p
ut
  800 PLA:PLA:JMP start
  810
  820 .sound1 EQUD &FFFE000
8:EQUD &00050004
  830 .sound2 EQUD &FFFE000
8:EQUD &00010005
  840
  850 .peas
  860 LDA x%:BNE pea1  \pea
s on screen?
  870 LDA #&81:LDX #&9D:LDY
 #&FF:JSR osbyte:TYA:BNE pe
a2:RTS  \SPACE pressed?
  880 .pea2 LDA #&F0:EOR &&
FDE:STA &&FDE
  890 LDA #&DE:STA address:
LDA #&6F:STA address+1:LDA
 #3:STA x%
  900 LDA #7:LDX #sound2 MO
D256:LDY #sound2 DIV256:JMP
 osword
  910 .pea1 CMP #39:BNE pea
3
  920 LDY #0:STY x%:LDA #&F
0:EOR (address),Y:STA (addr
ess),Y:RTS  \peas off
  930 .pea3 INC x%
  940 LDY #0:LDA #&F0:EOR (
address),Y:STA (address),Y
  950 LDY #8:LDA #&F0:EOR (
address),Y:STA (address),Y
  960 CLC:LDA address:ADC #
8:STA address:LDA address+1
:ADC #0:STA address+1
  970 RTS
  980
  990 .up  \INKEY(-58)
 1000 LDA ay%:CMP #40:BNE n
ottop
 1010 LDA #0:STA &2B:CLC:JS
R draw:PLA:PLA:JMP start
 1020 .nottop
 1030 DEC ay%:DEC ay%
 1040 LDA alien:STA old:LDA
 alien+1:STA old+1
 1050 LDA alien:AND #7:BEQ
up1
 1060 LDA alien:SEC:SBC #2:
STA alien:STA new:LDA alien
+1:STA new+1:JMP up2
 1070 .up1
 1080 SEC:LDA alien:SBC #&3
A:STA alien:STA new  \alien
=alien-&13A
 1090 LDA alien+1:SBC #&1:S
TA alien+1:STA new+1
 1100 .up2
 1110 LDA #&00:STA newdata+
1:STA olddata+1:LDA #&0C:ST
A newdata+2:STA olddata+2
 1120 LDX #3:LDY #24:JMP pr
int
 1130
 1140 .print  \uses new/old
/X=columns/Y=rows/olddata/n
ewdata
 1150 STX columns:STY rows
 1160 STX tempcol  \save co
lumns
 1170 LDY #0
 1180 SE]:LDA #4:.frame BIT
 &FE00:BEQ frame  \#FX19
 1190 .loop1
 1200 LDA old:STA temp1:LDA
 old+1:STA temp1+1  \save a
ddress of column
 1210 LDX rows
 1220 .loop2
 1230 .olddata LDA &3000:EO
R (old),Y:STA (old),Y
 1240 INC olddata+1:BNE p1:
INC olddata+2
 1250 .p1 LDA old:AND #7:CM
P #7:BEQ bottom
 1260 INC old:BNE p2:INC ol
d+1:.p2 BNE next1
 1270 .bottom  \row
 1280 CLC:LDA old:ADC #&39:
STA old:LDA old+1:ADC #1:ST
A old+1
 1290 .next1
 1300 DEX:BNE loop2  \next
row
 1310 LDA temp1:ADC #8:STA
 old:LDA temp1+1:ADC #0:STA
 old+1
 1320 DEC columns:BNE loop1
  \next column
 1330 LDA tempcol:STA colum
ns  \restore columns
 1340 .put  \put sprite on
screen
 1350 .loop1
 1360 LDA new+1:STA temp1+1
:LDA new:STA temp1  \save a
ddress of column
 1370 LDX rows
 1380 .loop2
 1390 .newdata LDA &3000,Y:
EOR (new),Y:STA (new),Y
 1400 INC newdata+1:BNE p3:
INC newdata+2
 1410 .p3 LDA new:AND #7:CM
P #7:BEQ bottom2
 1420 INC new:BNE p4:INC ne
w+1:.p4 BNE next2
 1430 .bottom2  \row
 1440 CLC:LDA new:ADC #&39:
STA new:LDA new+1:ADC #1:ST
A new+1
 1450 .next2
 1460 DEX:BNE loop2  \next
row
 1470 LDA temp1:ADC #8:STA
new:LDA temp1+1:ADC #0:STA
new+1
 1480 DEC columns:BNE loop1
  \next column
 1490 CLI:RTS
 1500 ]
 1510 NEXT
 1520 ENDPROC
 1530
 1540 REM Sprite Data
 1550 REM Balloon
 1560 REM rows=24/columns=3
 1570 DATA 0,1,35,70,71,120
,143,143,140
 1580 DATA 143,143,120,71,7
1,119,87,35
 1590 DATA 35,18,17,17,8,0,
0,255,150,105
 1600 DATA 15,9,15,240,15,1
5,0,15,15,240
 1610 DATA 15,15,159,111,15
,15,240,15
 1620 DATA 159,15,96,0,0,76
,38,46,225
 1630 DATA 31,31,19,31,31,2
25,46,46,238
 1640 DATA 174,76,76,132,13
6,136,0,0,0
 1650 REM Man
 1660 REM rows=24/columns=2
 1670 DATA 3,7,30,44,60,60,
60,112,96,119
 1680 DATA 238,255,255,187,
204,255,119
 1690 DATA 7,3,3,7,14,255,2
55,8,12,128
 1700 DATA 128,192,128,119,
160,32,102
 1710 DATA 238,204,204,0,13
6,136,136,0
 1720 DATA 0,0,0,0,0,136
 1730 REM Bang!
 1740 REM rows=24/columns=3
 1750 DATA 17,5,0,34,128,19
,1,0,140,1
 1760 DATA 0,2,196,2,68,9,3
2,0,85,0,64
 1770 DATA 1,0,0,32,34,0,10
,2,21,0,72
 1780 DATA 0,5,0,16,162,0,1
,4,0,42,0,129
 1790 DATA 0,0,0,162,0,68,4
,0,0,16,32
 1800 DATA 0,153,0,0,20,0,0
,34,0,0,4,0
 1810 DATA 0,129,0,0,0
```

This listing is included in this month's cassette tape offer. See order form on Page 61.



Taking the waiting out of *BACKUP

HAVE you tried backing up a disc using the Library utility *BACKUP on the Welcome disc? It's fine if you have a second drive attached to the Plus 3, but painfully slow if you haven't.

In this article we'll see how to access the floppy disc controller, which will enable us to write our own fast backup utility for single drive systems.

The way to access the disc controller is by using Osword calls &70 to &72. Osword &72 is the one we're interested in – this reads or writes data from or to the disc.

As with all Osword calls, a parameter block is required to pass some information to the routine.

The contents of this block tell the routine what it must do. Figure I shows how it must be set out.

Byte 0 should be zero. Check that this is still zero after the call. If it's not then an error has occurred, the value it contains being the error number.

Bytes 1 to 4 store the address in the Electron's memory of the data to be saved, or the address to place the data if we are reading the disc.

The least significant byte is stored first and the most significant last.

The function code in byte 5 tells the floppy disc controller what to do. It can take the values 8, 10 or 11. The first means read the disc, the second write and the last moves the read/write head to the specified track.

Always double check this when setting up a parameter block. If you write when you should be reading you will corrupt the disc.

The disc address the data is to be read from or written to is stored in bytes 6, 7 and 8, most significant byte first.

The disc address is the sector number, starting at 0. There are 16 sectors per track and 80 tracks. Note that this address is stored in reverse order, numbers are normally stored least significant byte first.

The top three bits of the most significant byte of the disc address, byte 5 in the parameter block, are ORed with the current drive number to get the new drive number to use.

This will normally be zero, so make sure these bits aren't set.

Byte 9 is a sector count. If this is zero the length of data to read or write is taken from bytes 11 to 14.

To read or write 1000 bytes of data you would place zero in byte 9 and 1000 in bytes 11 to 14, least significant byte first.

If byte 9 is not zero the length of data is ignored. Byte 9 is then used as the number of sectors to read or write.

Once the parameter block has been set up the A register is set to &72, the X and Y point to the parameter block and

Osword is called at &FFF1.

Armed with this knowledge, we can now tackle our fast backup utility.

To back up a disc what we need to do is to copy a disc sector-for-sector on to another disc. We'll then end up with an exact copy of the original disc.

The problem with *BACKUP in Library on the Welcome disc is that it only copies about two tracks at a time. This means that with a single drive system it will require over 70 disc changes as you swap between the source and destination discs.

Each track is 16 sectors and each sector is 256 bytes. This makes a track &1000 bytes long.

If the whole of RAM from PAGE to &8000 is used – and that includes the screen memory – we can fit in six tracks at a time.

PAGE is equal to &1D00, so six tracks will use up to &7D00. This leaves the bottom line of the screen free for messages, since this starts at &7E00.

Reading six tracks at a time means we can reduce the number of disc changes to about 26.

Some of you will have spotted that 80 divided by 6 is 13 and a bit.

Don't forget that two disc changes are required for each block of tracks copied – once to read the source disc and then to write to the destination.

If the whole of RAM from PAGE to &8000 is going to be used for reading and writing tracks there's going to be no room for the *BACKUP program.

However if it's written in machine code it can be tucked away in some unused area of memory. The function key buffer at &B00 is a good place to put it.

The accompanying program is a fast backup utility. Run it and call &B00 to back a disc up.

Any program currently in memory will be destroyed, and that includes the backup source listing itself, so don't forget to save the program.

As a precaution, always write-protect the source disc and make sure the destination disc contains nothing valuable. The old contents of the destination disc are destroyed.

The main loop of the program between lines 120 and 220 displays the prompts to insert the correct disc.

The subroutine *read_write* is called which in turn calls *FDC* to access the floppy disc controller using Osword &72.

There are plenty of comments throughout the listing so it shouldn't be too difficult to follow.

As you can see, reading and writing data directly to the disc isn't that hard.

Now we know how to read and write sectors using Osword &72 the next project is a sector editor. See you soon.

Byte	Function
00	Always zero.
01	Start address in memory of data.
02 03 04	Source or destination.
05	FDC function code.
06 07 08	Disc address (MSB) (LSB)
09	Sector count.
10	Unused – set to zero.
11 12 13 14	Length of data.

Figure 1: Osword &72 parameter block

```
  10 REM Fast Backup
  20 REM By R.Waddilove
  30 REM (c) Electron User
  40 track=&70:count=&71:a
ddress=&72:temp=&74
  50 oswrch=&FFEE:osrdch=&
FFE0:oscli=&FFF7:osword=&FF
F1:osbyte=&FFF4:osasci=&FFE
3
  60 FOR pass=0 TO 2 STEP
2
  70 P%=&B00
  80 [ OPT pass
  90 LDA #22:JSR oswrch:LD
A #6:JSR oswrch  \MODE 6
 100 JSR string:EQUB 28:EQ
UB 1:EQUB 24:EQUB 39:EQUB 2
4:EQUB 0  \text window
 110 LDA #0:STA track:LDA
#6:STA number+1
 120 .loop1
 130 JSR string:EQUB &0D:E
QUS "Insert source":EQUB 0:
JSR key
 140 JSR string:EQUB &0D:E
QUS "Reading":EQUB 0
 150 LDA #8:STA code+1:JSR
 read_write  \read tracks
 160 JSR string:EQUB &0D:E
QUS "Insert dest.":EQUB 0:J
SR key
 170 JSR string:EQUB &0D:E
QUS "Writing":EQUB 0
 180 LDA #10:STA code+1:JS
R read_write  \write tracks
 190 CLC:LDA track:ADC #6:
STA track  \next 5 tracks
 200 CMP #80:BCS done
 210 CMP #78:BNE loop1
 220 LDA #2:STA number+1:J
MP loop1
 230 .done RTS
 240
 250 .read_write
 260 .number LDA #0:STA co
unt
 270 LDA #&00:STA address:
LDA #&10:STA address+1  \lo
ad/save address
 280 LDA track:PHA  \save
track
 290 .loop
 300 .code LDA #0:STA bloc
k+5  \function code
 310 JSR FDC
 320 DEC count:BNE loop
 330 PLA:STA track  \resto
re track
 340 RTS
 350
 360 .FDC  \access floppy
disc controller
 370 LDA #32:JSR oswrch:LD
A track:JSR hexprint
 380 LDA #0:STA block  \al
ways 0
 390 STA block+4:STA block
+3  \high byte of memory ad
dress
 400 LDA address:STA block
+1:LDA address+1:STA block+
2  \load/save address
 410 CLC:ADC #&10:STA addr
ess+1  \increment for next
time
 420 LDA track:STA block+8
:LDA #0:STA block+7:STA blo
ck+6  \get disc address
 430 INC track  \increment
 track for next time
 440 LDY #4:.loop ASL bloc
k+8:ROL block+7:DEY:BNE loo
p  \track*16
 450 LDA #16:STA block+9
\sectors to read
 460 LDA #&72:LDX #block M
OD256:LDY #block DIV256:JSR
 osword
 470 LDA block:BNE error:R
TS
 480 .error STA err:LDA #2
2:JSR oswrch:LDA #6:JSR osw
rch
 490 BRK:.err EQUB 0:EQUS
"Disc error":BRK
 500
 510 .key  \wait for key p
ress
 520 LDA #21:LDX #0:LDY #0
:JSR osbyte  \*FX21
 530 JSR string:EQUS " :Pr
ess a key":EQUB 0
 540 JSR osrdch  \GET
 550 LDX #count MOD256:LDY
 #count DIV256:JMP oscli  \
*MOUNT
 560
 570 .mount EQUS "MOUNT":E
QUB &0D
 580
 590 .string  \print strin
g
 600 PLA:STA temp:PLA:STA
temp+1  \get string address
 610 LDY #0:BEQ ps2
 620 .ps LDA (temp),Y:BEQ
ps1:JSR osasci  \zero ends
 630 .ps2 INC temp:BNE ps:
INC temp+1:BNE ps
 640 .ps1 LDA temp+1:PHA:L
DA temp:PHA
 650 RTS
 660
 670 .hexprint
 680 PHA:LSR A:LSR A:LSR A
:LSR A:JSR printit  \left d
igit
 690 PLA  \right digit
 700 .printit
 710 AND #&0F
 720 SED:CLC:ADC #&90:ADC
#&40:CLD
 730 JMP oswrch
 740
 750 .block EQUD 0:EQUD 0:
EQUW 0  \FDC parameter bloc
k
 760 ]
 770 NEXT
```

Micro Messages

Make those errors give themselves away

IT is not usually possible to automatically list a line which contains an error from within BBC Basic.

There are, I believe, eproms available which do give this facility. However, I have written a short procedure, which if called from a main program, with a line such as:

```
!ØON ERROR MODE 6:PROCer
ror:END
```

will switch to Mode 6, report on what type of error it is and at what line, and will then automatically LIST that particular line.

This can be very useful if your typing is anything like mine, where a longish listing can contain many errors.

*Here is the error trapping procedure. If the line numbers are given high values the program can be *SPOOLed and then *EXECed back into your own programs.*

```
10000DEF PROCerror
10010REM Routine to list er
ror line
10020error=ERL
10030REPORT:PRINT" at line
";ERL
10040PRINT'"Please check th
e following line "''
10050OSCLI"KEY"+STR$(1)+"LI
ST"+STR$(error)+"|M"
10060*FX138,0,129
10070ENDPROC
```

On another matter, can anybody help me with a problem concerning the Mannesmann Tally 80+ printer?

It would seem that all of the screen dump routines available for Epson compatible printers work on the principle that the printer has only 960 dots per line, whereas the Mannesmann Tally has 1280 dots per line.

This means that the Epson screen dumps, when used with the Mannesmann, give a squashed picture, making it impossible to dump circles. – **Nicholas John Dickenson, Chichester.**

● Has anyone got a dump for the Mannesmann Tally?

Snapper scores

AS a first time reader of Electron User, *I must congratulate you on a most informative and entertaining magazine. I would like to see more tips on Basic programming for the very beginner like myself.*

On the claims to fame, I must tell you about the Snapper scores reached by my wife, 96,810, my daughter (age 11) 66,790, my son (age 7), 28,720. All three are still snapping and aiming for higher achievements. – **Joe Devlin, Marden.**

● You wouldn't believe it, but we've known some extremely naughty types to actually change the coding of programs to achieve high scores – especially where there's a prize involved!

Dump needed

I OWN a printer for my Electron for which I don't have a "dump out" program. I was wondering if you could help me? – **D. Smith, BFPO 33.**

● If your printer is Epson-compatible try the screen dump in the March 1985 issue of *Electron User.*

Support continues

IT seems ever since Acorn got into financial trouble the Electron has been just about forgotten.

Acorn hasn't produced any new hardware expansions. Acornsoft hasn't produced much in the way of software and just about every software house in the business, excluding Superior Software of course, has given up producing games for it.

I know the Electron is a far better computer than the others in its price range but the software houses have given up.

I would be grateful for any assurance from you concerning the Electron's future. – **P.A. Phillips, Stansted.**

PS: The foolproof method of verifying a high score is to take a photo of the high score label with the scorer's name, or simply a photo of the screen showing the high score.

● Advanced Computer Products and Slogger have some excellent add-ons for the Electron, so although a few companies may have stopped supporting the Electron, others are convinced, as we are, that there's a lot of life left in it yet.

Speedier Skramble

HAVING been playing with the game Skramble (Electron User, *May 1985) for a while, I decided to alter the program to enable me to get rapid fire for my plane.*

But my knowledge of machine code is so thin – you can see right through it – I have given up.

Can you or your readers supply a program that will speed up the plane's firing rate please? – **S.M. Adams, Malpas.**

PS: Your show at Umist, Manchester was great.

● It would be too complicated to alter Skramble as you wish. It was only designed to fire one missile at a time. Sorry.

Manic Mole line-up

IN your Manic Mole listing lines 360 and 780 are missing.

I am very pleased with your Guide to Electron software for education. I was wondering what was available and where from. – **Simon Owen, Belton, Norfolk.**

● Lines 360 and 780 don't exist, so if you can't get the program to work there must be some typing errors elsewhere in your version.

Adventure games

I'VE only been an Electron owner, and reader of Electron User, *for a few months now, and I greatly enjoy keying in the various arcade-type game listings you publish.*

However I am very much into adventure games, so I was very pleased to see the listing for Dungeon Quest in the October issue.

This led me to wonder if there are any listings for mini-adventure type games in previous issues of Electron User?

I have three small children aged 7½, 5 and 2, and the two eldest greatly enjoyed the Activities and Pirate Maths programs in the June and July Electron Users.

Can we please have more of these type of educational fun programs in future issues? Again, are there any such programs in back issues of Electron User?

Merlin's Cave is a great help

→

From Page 67

in getting through adventure games, but I was wondering if a little space could be set aside for an Adventurer's Contact Column.

I am very keen to contact fellow adventure players on the Electron with a view to exchanging clues and so on, and swapping adventure games.

As I'm unemployed, swapping those adventures I've completed with other adventurers is easier on my pocket than buying new games.

Obviously adventurers swapping games can help each other with the ones they've completed. – **Larry Horsfield, Charlton, London.**

● The Necromancer in this issue should satisfy your desire for adventure.

Most issues have an educational game. Cedric in the May 1985 issue and Odd One Out (April 1985) are particularly good for younger users.

The contents of the monthly tapes should give you an idea of what we published and when.

Just didn't adapt . . .

IN the September issue of Electron User *M. Milner asked about a Mode 7 adapter for the Electron.*

You said that there isn't one available, but in the October 1984 issue there is a small article about an adapter made by Sir Computers of Cardiff.

Is it still on the market? – **P. Wilson, Ruislip.**

● The Sir Computers Mode 7 adapter didn't make it and the company is no longer with us.

Tapes to disc

I HAVE an Acorn Electron and have recently acquired the Plus 3. This is an excellent addition to my computer and the Welcome disc which came with it was also excellent.

My only disappointment is that I cannot transfer some games I have bought on tape by Acornsoft and MicroPower on to disc. Could you tell me if there is a cassette or disc available for copying bought cassette games on to discs for the Plus 3? – **Kenneth Towers (15), Preston. Preston.**

● We haven't heard of a tape to disc copier for the Electron, but software is starting to appear on Plus 3 discs now. Acornsoft have released a games disc and a database.

A definite Plus

I AM thinking of getting a Plus 1 and am also thinking of getting a disc drive but the Plus 3 unit is too expensive.

Is there a disc interface which plugs into the Plus 1 and allows use of many disc drives?

Also is there any possibility of connecting up an Alphacom 32 printer which is for the Spectrum (I used to own one) to my Electron? – **A. Cole, Leominster.**

● Have you seen our special offers? The Plus 1 and Plus 3 are now excellent value for money.

The Plus 3 has an edge connector to take another external drive.

We'll have to pass the Alphacom problem over to our readers. Can anyone help?

Data recorder problems

REGARDING J. Gilbert's letter, I also had trouble with the Acorn data recorder within the guarantee period. It would not record from my Electron.

So I took the "Me and My Micro" pack back and got it tested.

When it was found faulty, I told them to keep the data recorder and traded it in for a Plus 1 as I had an old cassette recorder I bought years ago for my ZX81. Ughhh.

I thought this would do until I bought a Plus 3, which I now have.

With the Plus 3, the Electron looks and acts really great.

All I want to know is – is more disc material available? – **A.P. Sheard, Kings Lynn.**

● Part II of our disc series is all about using directories on the Plus 3, and there's more to come. You're not alone with recorder problems.

★ ★ ★

I, too, have experienced problems with my Acorn data recorder.

Despite using it very carefully, it broke after six weeks.

Is this a common fault on machines? Or have we purchased a faulty batch? – **P. Leonard, Birmingham.**

★ ★ ★

I REGRET to inform J. Gilbert that he wasn't the only one to be "just unlucky".

Purchased in February, data recorder No. 1 lost a piece of plastic off the cassette lid within a few days. Shortly afterwards the record button returned too high and wouldn't be depressed. Another small piece of plastic had broken off.

Normal function was only gained by tapping the recorder upside down.

Needless to say a replacement was required – and supplied without question by the dealer.

Within two days recorder 2 malfunctioned in the same way.

A temporary modification to stop the button returning too high solved the problem until there was a further fault of no transmission in the play mode.

Recorder 3 is so far still functioning, all machines having received respectful treatment.

A letter to the manufacturers to enquire if there was a design fault just brought forth a reference to the Sale of Goods Act and instructions to visit the supplier again – not very helpful.

The cassette recorder has been around for a good many years and these faults should have been remedied long, long ago. – **P.E. Carnell, Southampton.**

★ ★ ★

WITH reference to J. Gilbert's letter in the July issue of Electron User, *I assume the Acorn data recorder referred to is the type ALF01 as supplied with the starter pack.*

My recorder ceased to work and, being inquisitive, I decided to take it to bits to find out why.

The problem in my opinion is a design fault in two areas.

The metal posts on the record button slide are not set at the correct position and allow the slide to come out of its guide, therefore jamming up the complete mechanism.

The plastic guides/frame is not robust enough.

The first sign of anything starting to go wrong with the recorder is when the record button starts to protrude slightly above all the other buttons.

This is due to the slide mechanism being "half in" and "half out" of its guide.

Two of my colleagues both have the same recorder. One has returned his four times, the other once.

Both were told by the stores involved that they had had quite a few recorders returned.

I would hope by now that the manufacturer has solved this problem as, having used other recorders, I find the Acorn data recorder the most reliable for reading and recording data. – **Peter Elcoat, Wallsend.**

● These are just a few of many letters we've received concerning the Acorn Datacorder. It seems they have a serious reliability problem with it and have stopped supplying

Sprites break up

PART 4 of Roland Waddilove's series on machine code graphics is what I have been awaiting for ages.

On receiving November's issue I soon had the sprite print listing in action.

Great, I thought, until I placed the sprite further up the screen, at &6000, when to my disappointment it only printed the tail section. As it moved further down the screen the wings appeared and then the nose.

I have played with the

program for hours and hours trying to debug it, but to no avail.

I have managed to include cursor control, left and right, up and down although as yet I haven't been able to do all four together.

I would persevere, but it loses parts as it goes up the screen. No problem at the bottom end, but that's not much good.

What is the bug? I have checked and rechecked the listing, but it is the same as yours.

By the way line 170 is missing from my copy of Electron User, *or at least the first half, which I assumed was for OSRDCH and soon sussed out.*

However the breaking up sprite I cannot. Can you help? It is so frustrating . . .

Also are there any good quality graphic adventure games, where you control yourself and have an adventure like the text ones?

Keep up the good work, I always find your magazine interesting and helpful with some good listings in it. I only wished I had the time to type them all in. – **D.R. Coe, Benfleet.**

● There isn't a bug in the sprite program in the November issue. The problem is that the sprite print routine cannot print the very large sprite fast enough.

The screen display is updated every 50th of a second. When the sprite is moved it is first erased and then reprinted at the new position.

When it is near the top of the screen the display is updated when the sprite has been erased and before it's been reprinted. Consequently you can't see it.

When it is near the bottom of the screen there's enough time to reprint it before the lower part of the screen is displayed.

If you reduce the size of the sprite you'll solve the problem.

Twin Kingdom Valley is a good graphic adventure. There are about 170 detailed pictures in it.

Video connection

COULD you please advise me as to the purpose of the Video connection on the Electron? – **F. Matthews, Doncaster.**

● The video socket is for connecting your Electron to a monitor.

A monitor provides a much clearer picture as it accepts a direct signal which has not been modulated – that is, processed specially for TV.

The output is in black and white though.

Sweet trap

PLEASE could you tell me how to get past level 2 on Blagger – the sweetshop?

I can get along the conveyer belt and jump on to the ledge on the right hand side, but I can't get off the ledge. And please could you tell me on The Mine by Micro Power why your score doesn't go on the scoreboard when you get 100,000? – **William Calderbank, Rainford, Merseyside.**

● Are there any arcade experts who can help?

Printer drivers

YOU may be interested to know that I have been using Acornsoft's Printer Driver Generator for the BBC Micro with my Electron and a Centronics 737 printer.

The generator allows you to produce tailor-made printer drivers for your printer, utilising the two highlighting commands in View (FUNC H and FUNC J).

The program asks you a number of questions on screen about your printer, and in particular the control codes it uses.

If you have a Facit 8105, a Ricoh Flowriter 1600, an Epson FX80, a Juki 6100 or a JP101, an answer file is provided.

I have not been very ambitious, and use basically only two different drivers. The main one allows for underlining and elongated print.

A second driver makes use of a facility to send an initialisation message to the printer, which causes all the print to appear in the 16.7 cpi mode.

The latter is very useful for producing work with Viewsheet, as it is possible to squeeze many more columns across the page. This driver also underlines and gives elongated print.

I have also had to include a line feed in each of the drivers due to a curious compatibility problem between View and my printer.

My printer will not accept more than one line feed at a time with View, so that while I do have each line appearing one beneath the other, I cannot create paragraphs or double line spacing.

*The solution has been to turn off the printer's line feed – I had a switch fitted to mine – and either use *FX6,0 in the command mode or include a line feed in the printer driver.*

Unfortunately this has caused a side effect, namely the creation of a higher than normal number of spaces at the top of each page.

Does any reader have a solution to this problem?

Another View curiosity is the fact that when text is loaded back into the computer it sometimes leaves one or more spaces between the default ruler and your own ruler.

If you print out without eliminating this gap you may find that it will cause havoc with your page layout.

In one instance I found that the computer had decided that it could not put any more on a page, so it moved the printer on to a fresh page.

There was a "page eject" command in the text, which was the first thing the computer read after it had moved onto the new page.

The result was a blank sheet of paper separating two pages of text. – **Peter Savage, Burgess Hill, West Sussex.**

PALINDROME PROGRAM

HAVING read your article in the September issue of Electron User *on LEN$, I read up on MID$, LEFT$ and so on in my User Guide, Basic words I had never really thought about before.*

I then set myself the task of entering a word into the Electron and getting the computer to print out that word in reverse.

Having achieved that goal I went on to make the computer tell me if the word was a palindrome or not.

This was something which kept me, a relative novice, thinking for some time, I can tell you.

I enclose the resulting program which I regard as possibly the most useless program ever written, but it may faintly amuse or interest others. – **Andrew Brisbane, Salisbury.**

```
  10CLS                    70PRINTMID$(word$,x%,1);   ID$(word$,pos%,1) THEN PRIN
  20PRINT                  80NEXT x%                  T "NOT A PALINDROME":GOTO 20
  30PRINT"ENTER A WORD"    90PRINT:PRINT                130 pos%=pos%+1
  40INPUT word$            100pos%=1                    140NEXT y%
  50length%=LEN(word$)     110FOR y%=length% TO 1 ST    150PRINT"IT IS A PALINDRO
  60FOR x%=length% TO 1 ST EP -1                        ME"
EP -1                      120IF MID$(word$,y%,1)<>M    160GOTO 20
```

Contact

PLEASE could you tell me where I can contact the Christian Micro Users Association mentioned in the last issue of Electron User? – **Mrs A.E. Jackson, Sutton-in-Ashfield.**

● The Christian Micro Users Association can be contacted at 138, Bramwell Gardens, Sheffield S3 7PW. The secretary is Philip A. Clark.

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The EIGHTH annual New Year SALE

of Electron programs
ENDS THURSDAY 31ST JANUARY

The £12.50 utilities at £4.95 each!

DATA FILE

This one has everything! Create your own file of up to 20 fields, decide the length of the fields then name them. Insert the data by just typing in. Search either the start of a field or anywhere in a field!

Edit simply by the cursor keys. Jump to any record you want. Sort any of the fields not just the normal first one!

Print, with or without the labels, through the Plus One interface to a printer. Save the entire file to cassette.

Create as many files as you want, for any purpose you want and just how you want. The choice is entirely yours!

MICROTYPE

Now firmly established as the 'standard' typing tutor for the BBC, it has been faithfully converted to the Electron. As used in over 200 colleges and schools and in training by ICI, NCB, Shell, Boots, Post Office, British Telecom, etc. etc.

The program gives both exercises and sentences with a complete analysis of your average typing speed, accuracy and the keys mis-typed. If you wish to master the computer keyboard, then this is the program for you.

PERSONAL ACCOUNTS

A tape based accounts program holding up to 450 transactions, accepting debit and credit entries, references and date, with a balance shown after each entry. Any of the 32 categories can be customised; scrolling; edit entries or balance; estimate; status; save and load files. Absolutely ideal for home accounts.

The £8.50/£9.50 games for just £3.95

FIGHTER PILOT

A true 3D cockpit view of both the runway during take-offs and landings and the enemy fighters which you have to blast out of the sky. Graphics included an accurate radar system and a true combined artificial horizon and turn and bank indicator. Information also shown on fuel, speed, altitude, rate of climb and score. Very active.

CAVEMAN

Take the barrow down the lift into the many galleries of the mine to first dig for diamonds and then for gold. If you manage to escape the monster by astude use of your ladders, you then go down again for coal to refuel the furnace which depletes as the lift keeps working.

MANIAC MOWER

Try your hardest to mow the grass in the park whilst avoiding the maniac mower, whose only aim is to cut you up! To make it harder, you must not go over your own tracks. To make it harder still there are lots of nasties lurking in the grass –all out to get you. To make it even harder still there's a karate expert training in the park, who is very unfriendly!

MUNCHMAN

This is the one that started it all—a real live 'Pacman' for the Electron. Just like the original Arcade game with the ghosties chasing you around as you devour, with of course the energisers which give you the limited time to zap the ghosties.

SNAKE

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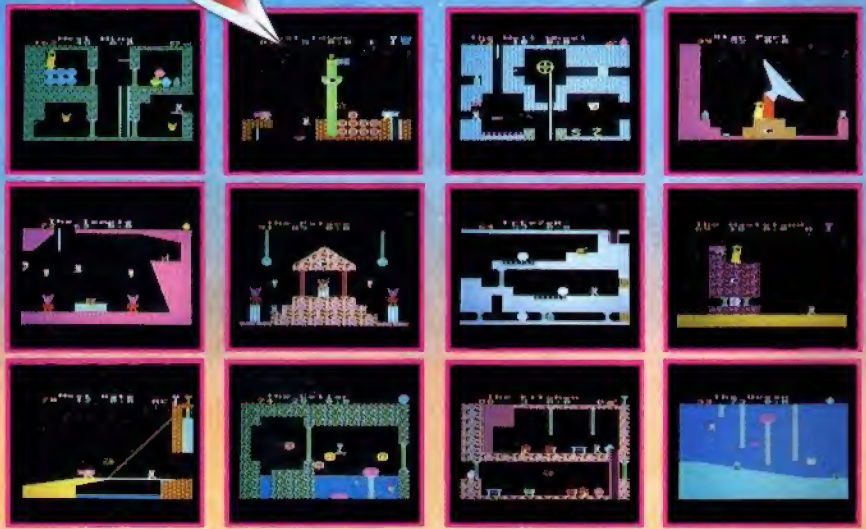

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